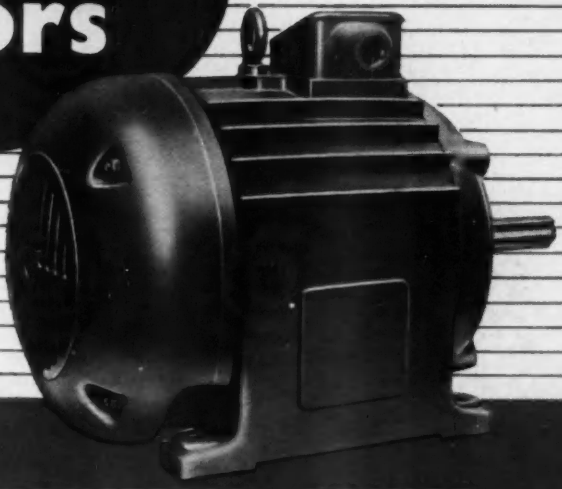
ELECTRICAL TIMES

THURSDAY
13 APRIL
1950
SIXPENCE

'ENGLISH ELECTRIC'
motors



FOR ALL INDUSTRIAL DRIVES

The ENGLISH ELECTRIC Company Ltd.
INDUSTRIAL MOTOR WORKS — BRADFORD
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COOKING IN CRAMPED QUARTERS?

The ready-made solution

is the Creda Cadet. Not just another breakfast cooker—it's designed to do *all* cookery jobs. The Cadet is *fully insulated*, has a thermostatically controlled oven, radiant type boiling plate controlled by Simmerstat and a warming cupboard. And, so important from the customer's point of view—the Cadet connects to an ordinary domestic heating point. Total wattage 2,800 Catalogue No. CTI

Creda CADET

MADE BY THE HOUSE OF **Simplex**

SIMPLEX ELECTRIC COMPANY LIMITED
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A TI COMPANY

WORLD ACCLAIM!

"Sterline"

overhead low-voltage transmission cable embodies features which we can justly claim to be abreast of, if not in advance of the times. Not only do we ignore climatic extremes, we know STERLINE has a lower initial cost—is lighter in weight and is easier to handle than the "old" braided and compounded weather-proof aerial wire. Needless to say, we have made and are still making many thousands of miles of the type we now call "old", simply because we stress the importance of pleasing all cable users.

Full details of STERLINE will be sent on request: these will include specification, sizes, weights and prices.

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CABLE COMPANY LIMITED

ALDERMASTON BERKSHIRE

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General view of the light Section Casting Track.

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Metallurgy allied to mechanisation is a product of this century. The Sprotborough Foundry of the Marshall Organisation is fully mechanised for the production of Castings from 1 lb. to 10 cwts. with complete efficiency and with High Quality associated with full Technical and Metallurgical Control. Grey Iron Castings for Industry are our business, why not contact us with your problems.

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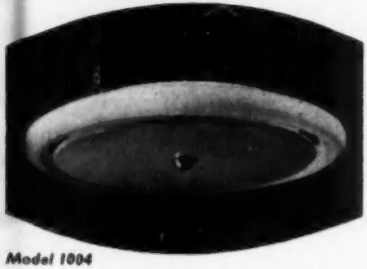

Model 1004

80 watt circular fluorescent fitting

Write, 'phone or call for descriptive leaflet

DRUBEL

£8 . 17 . 6
(Incl. Tube & P.T.)
Also Model 1001
£7 . 17 . 6

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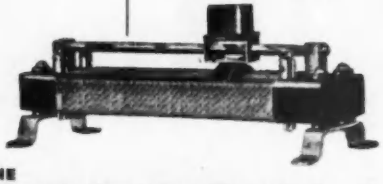
A few territories for wholesale distribution still available

SEND YOUR RESISTANCE PROBLEMS TO US

List No. 80 containing data and prices of our standard sliding Resistances is both useful and interesting. May we send you a copy ?

● We shall be glad to co-operate in their solution and to suggest suitable Apparatus. CRESSALL Resistances incorporate the soundest electrical and mechanical principles in design—yet prices are competitive.



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CRESSALL
MANUFACTURING COMPANY, LTD.
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Phone, Aston Cross 2666 (3 lines). Grams "Ohmic" B'ham

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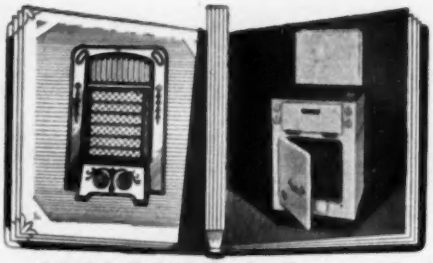


The Story of BELLING *& Company Ltd.* No. 2.

I think the best thing I can do in this issue is to give you a brief overall picture of the appliances we introduced year by year from 1912 to date, and here it is:

1912 Started in Enfield with one man, one boy. Took out first firebar patent. Produced first fire, the "Standard", first Immersion Heater, first kettle.

1913 Introduced several fire designs, one being circular with lighting effect.

1914 Moved to larger works at Derby Road, Edmonton.

1915 Commenced war work for Admiralty on heating equipment for submarines.

1916 Extended factory. Increased war work. Commenced business in Canada.

1917 Started making Canteen equipment. Roasting and Baking Ovens, Hotcupboards.

1918 Made glue pots, solder baths, water urns, steamers and water heaters.

1919 Made first Pressed steel "Modernette" cooker, also boiler, kettle, iron, urn.

1920 Improved fire designs, "Office", "Standard", "Boudoir", "Centre", "Library".

1921 The new "Multi-parabola" firebar and imitation coal first introduced.

1922 "Cookerette" put on market — the forerunner of the "Baby Belling".

1923 Made our first "inset" or wall fixing fire for builders.

1924 Patented our improved "Immersion" heater, with removable element.

1925 Moved to Enfield. Made new range domestic cookers with plug-in elements.

1926 First reflector type fires marketed. 10-gallon Wash Boiler introduced.

1927 Range of tube heaters made. First solid cast iron boilers introduced.

1928 Cast iron "boiler-griller" first introduced —now standard on all cookers.

1929 No. 2 "Baby Belling" Cooker came into existence—first of the line.

1930 Improved imitation coal, moulded glass slabs, new camouflaged firebar.

1931 Made first "all enamel" cooker—probably the first in the Industry.

1932 Introduced first fires with "Imitation Logs." Opened in Regent Street.

1933 Produced first reflector type fire with rod elements, also "Inset" fires.

1934 "Knife blade" contacts used for cooker boiling plates. Great success.

1935 First introduction of glass doors on cookers. Improved "Baby Cooker".

1936 Several fires combining "radiated" and "convected" heat were produced.

1937 "Streamline" cooker in white acid resisting enamel first made.

1938 Imitation coal greatly improved. Big variety of appliances produced.

1939 "Champion" heaters introduced. Largely used in air raid shelters, etc.

1940 Started war work on hand grenades and mortar bombs in big quantities.

1941 In addition made 2 in. trench mortar sights, sten gun parts, etc., etc.

1942 Added hotcupboards for aeroplanes and huge quantities tail units.

1943 Radio cases, radar cases, telescope cases, ammunition boxes added.

1944 Runway lights, rocket guns, amphibious tank parts in big quantities.

1945 Over a quarter of a million Jettison tank parts were produced.

1946 Commenced making "V" cookers in big quantities for housing drive.

1947 Commenced export drive sending senior staff to the Americas and Europe.

1948 Introduced our "Streamline" Cooker on wheels with illuminated interior.

1949 Plate Warming Cabinet and trolley, also Clothes Drying Cabinets marketed.

1950 Large factory extension nearly ready. Made our biggest export shipment.

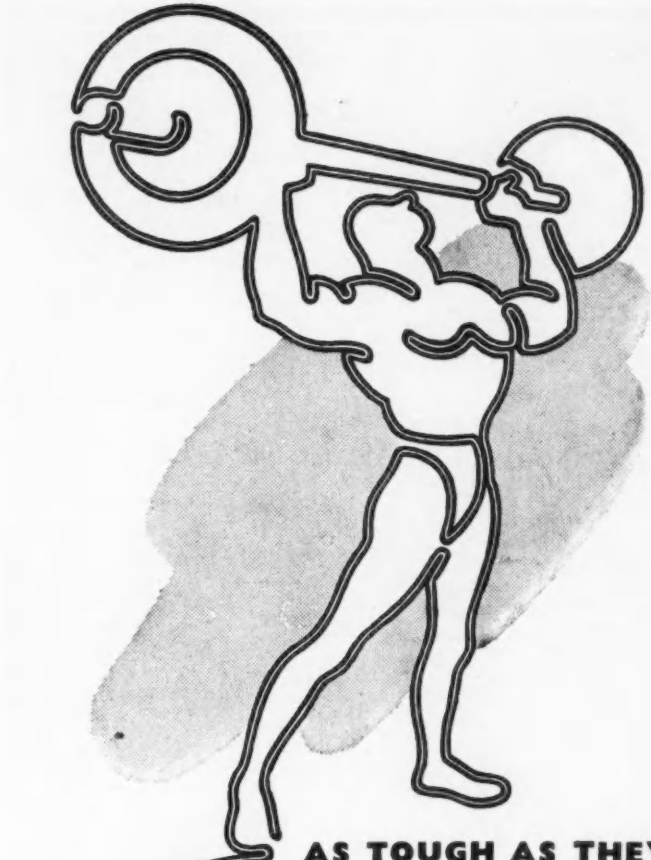
In the next chapter I shall deal in more intimate detail with the trials, tribulations and successes I had in the first three years.

C. H. Belling

Belling & Co. Ltd., Bridge Works, Enfield, Middx. Tel: Howard 1212

CRC 2

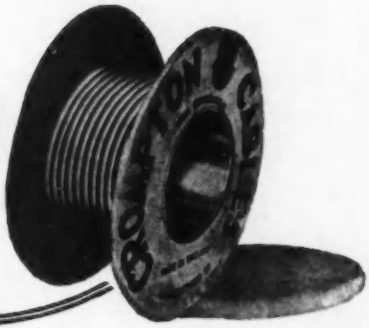
See our exhibits at the B.I.F. BIRMINGHAM May 8 — 19



AS TOUGH AS THEY MAKE 'EM

Crompton

T.R.S. CABLE



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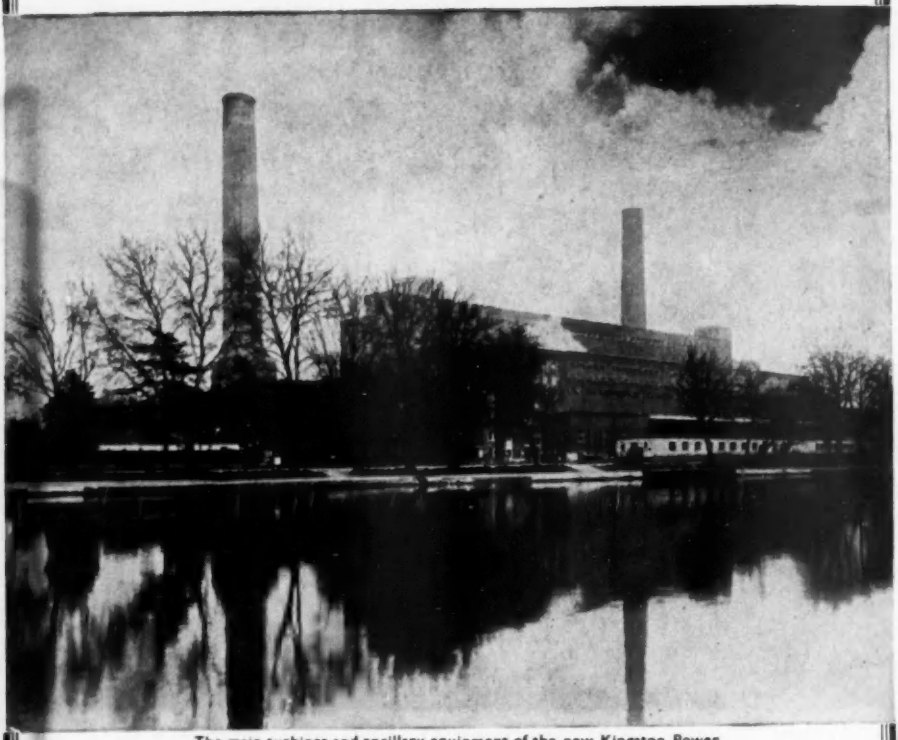

The main turbines and ancillary equipment of the new Kingston Power Station are lubricated exclusively with Wakefield Industrial Lubricants.

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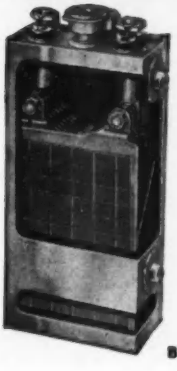
C. C. WAKEFIELD AND COMPANY LIMITED · LONDON · W.1

AMZ



As resilient as a springboard, the Alklum Steel-Alkaline Battery recovers immediately the 'load' is removed. Sturdy construction fits it for service under the most difficult conditions. Its compactness suits it particularly to every job where saving space is important. For maximum service with minimum maintenance costs it's an Alklum Battery every time.

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HIGGS MOTORS
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TOTALLY ENCLOSED
FAN COOLED
The Higgs Motor that gives
confidence under the most
adverse running conditions
GUARANTEED FOR EVER

**Belfast, Birmingham, Bristol, Dundee, Glasgow, London,
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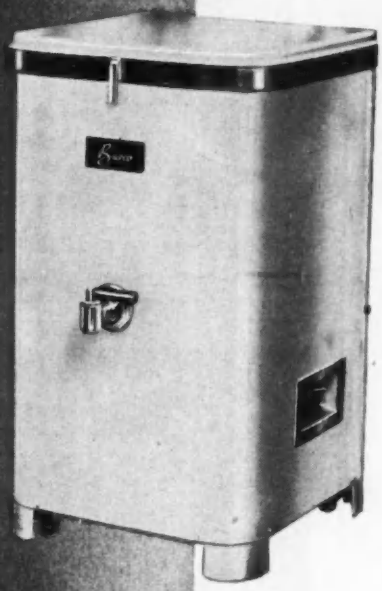
Burco

ELECTRIC WASHBOILER

CAT. NO.
E840

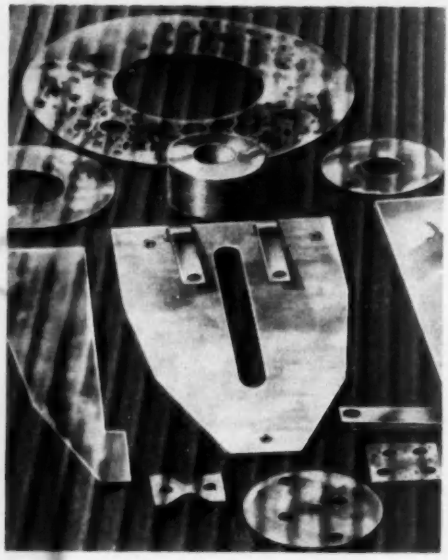


This "Burco" model represents absolute perfection in Washboiler design. Every detail of manufacture is embodied to ensure a long, trouble-free life and handsome appearance.
Like every "Burco" model, Cat. No. E840 is a product of years of specialisation.

ALL ENQUIRIES TO

BURCO LTD

ROSE GROVE · BURNLEY · LANCS



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Our new factory, backed by years of experience, enables us to supply all sorts of mica and micanite stampings, washers, stove plates, element formers and complete heating elements rapidly and at competitive prices.

Our complete insulation service also offers bakelite and micanite tubes and covered bars, compression and injection mouldings, and fabricated parts in bakelite sheet, rod and tube.

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Another model has a white enamelled metal gallery. In each case, gallery and shade simply clip together and fit on to any standard B.C. shade carrier lampholder. There are no screws.

All are in two sizes, 9″ for lamps up to 60 watt and 11″ for lamps up to 100 watt.

The vitreous enamelled Metal Coolicon is still available in both sizes.

All have regulation cut-off using the largest lamp recommended, thus fully complying with the Factory Act.

			Plastic.	All Metal.
9″	...	...	*5/-	7/-
11″	...	...	*6/-	8/-

* Plus Purchase Tax of 25% on list price.

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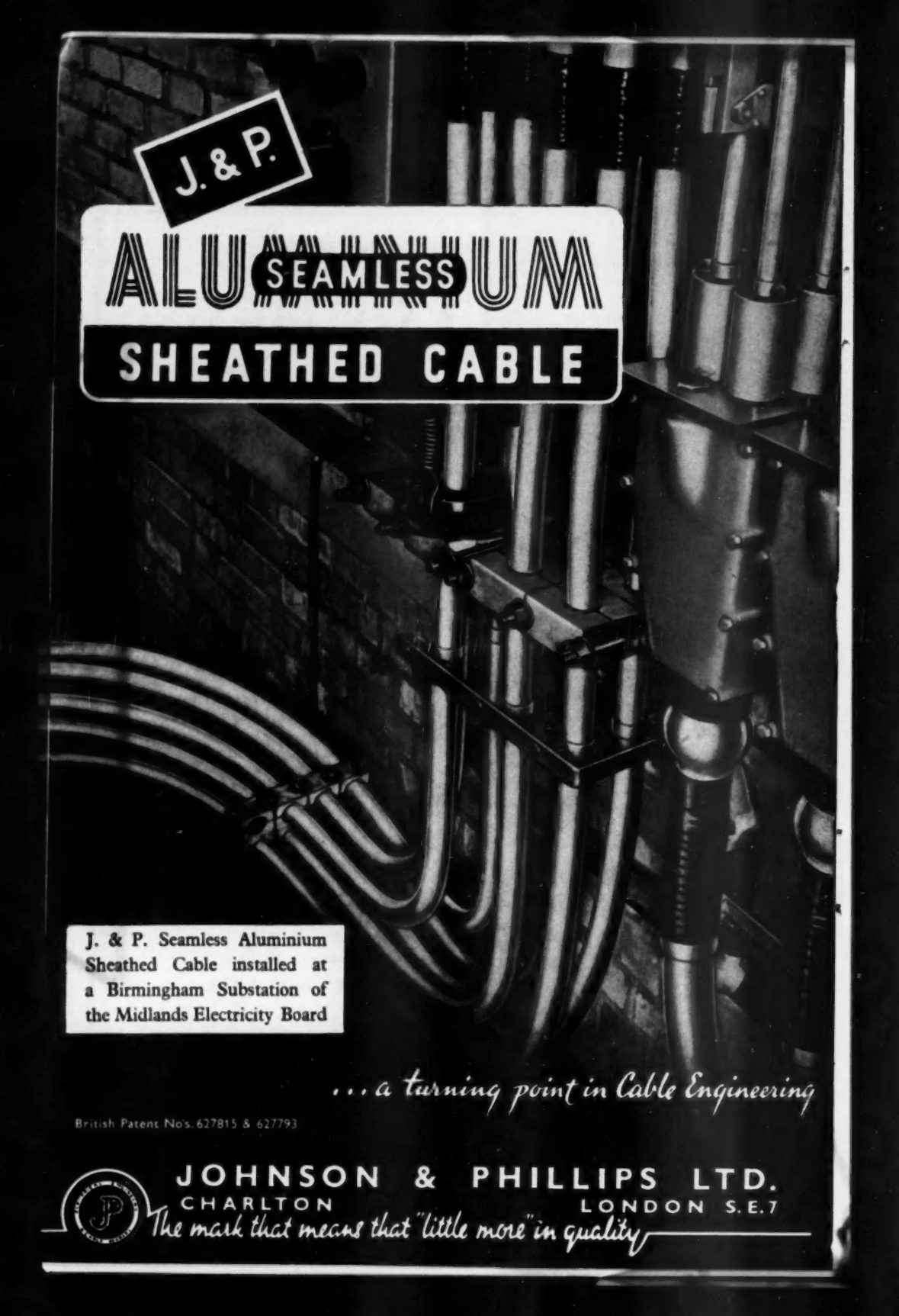
5, Corporation St., Birmingham, 2. *Telephone :* Midland 5197.

49, Basinghall St., Leeds, 1. *Telephone :* Leeds 25579.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J. & P. Seamless Aluminium Sheathed Cable installed at a Birmingham Substation of the Midlands Electricity Board
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Kill rot in standing poles—by

Cobra re-impregnation

The fall of a transmission pole through hidden decay can disrupt your service, lead perhaps to a serious accident. Why take this risk when now you can ensure against it with the Cobra deep-injection process of re-impregnation?

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THE MODERN METHOD OF POWER DISTRIBUTION TO INDIVIDUALLY DRIVEN MACHINE TOOLS.

DESIGNED FOR EASY RE-ARRANGEMENT OF MACHINE SHOP LAYOUTS

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'PLUG-IN' BOXES for making connection to the live busbar at the power points, incorporate "English Electric" high rupturing capacity non-deteriorating cartridge fuse links.

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Works also at STAFFORD · PRESTON · RUGBY · BRADFORD

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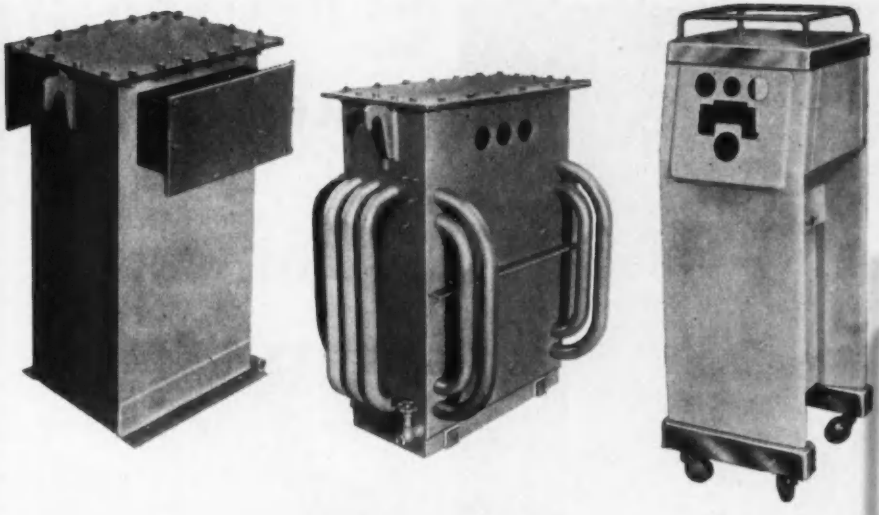

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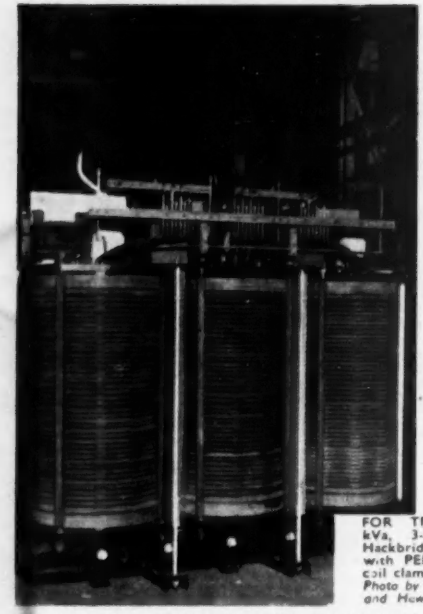

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For use with 'Simmerstat' or any other Impulse type control. A very fast plate—responsive to control—reliable in service—economical in use.

Always specify "Backer" Plates in your cooker

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Advert of the
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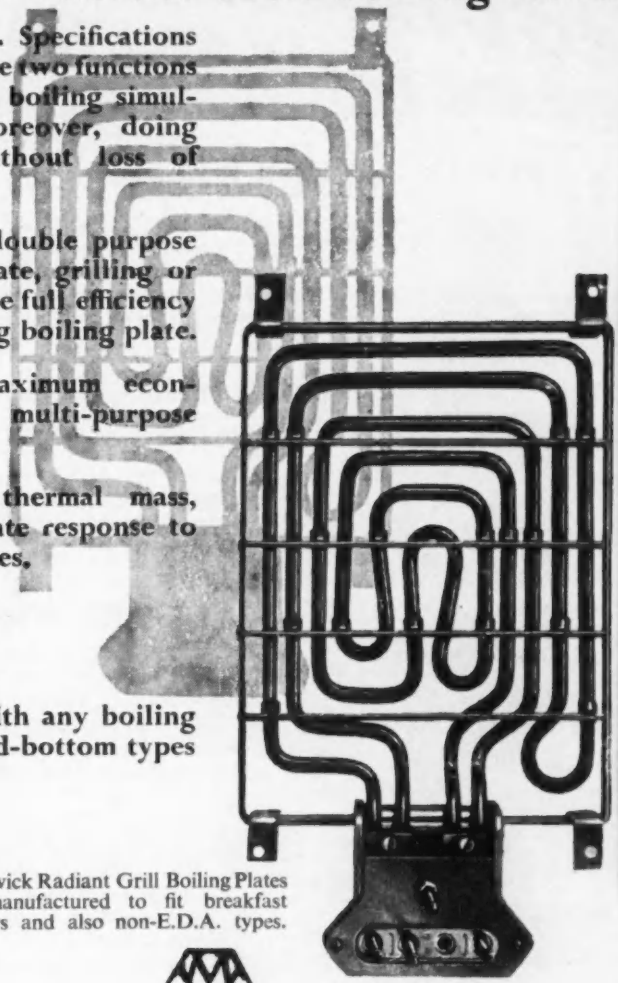
- **Efficiency with any boiling vessel; machined-bottom types unnecessary.**



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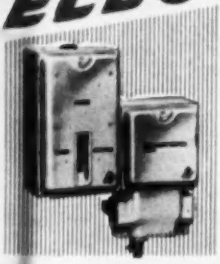
The complete range of electrical products manufactured by BICC are contained in Publication No. 215 Vf , obtainable on request.



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By combining switch and fuse-chamber, the BICC Two-Piece Consumer's Service Unit reduces installation time, saves space and initial cost. It is safe in use and designed for the convenience of consumer, supply authority and wiring contractor. Write for Publication 248 V.

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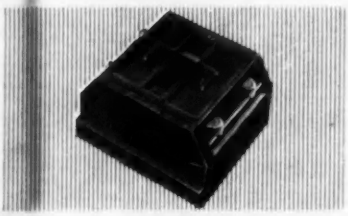

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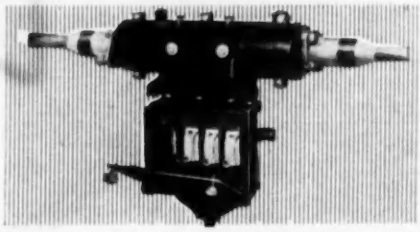

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BICC Fused Tee Boxes provide a valuable means of teeing-off from a paper insulated, lead-covered feeder cable and frequently permit a substantial reduction in sub-station L.V. switchgear. The fuse box incorporates high-breaking capacity fuse protection for the branch circuit. Send for Publication 226 T.

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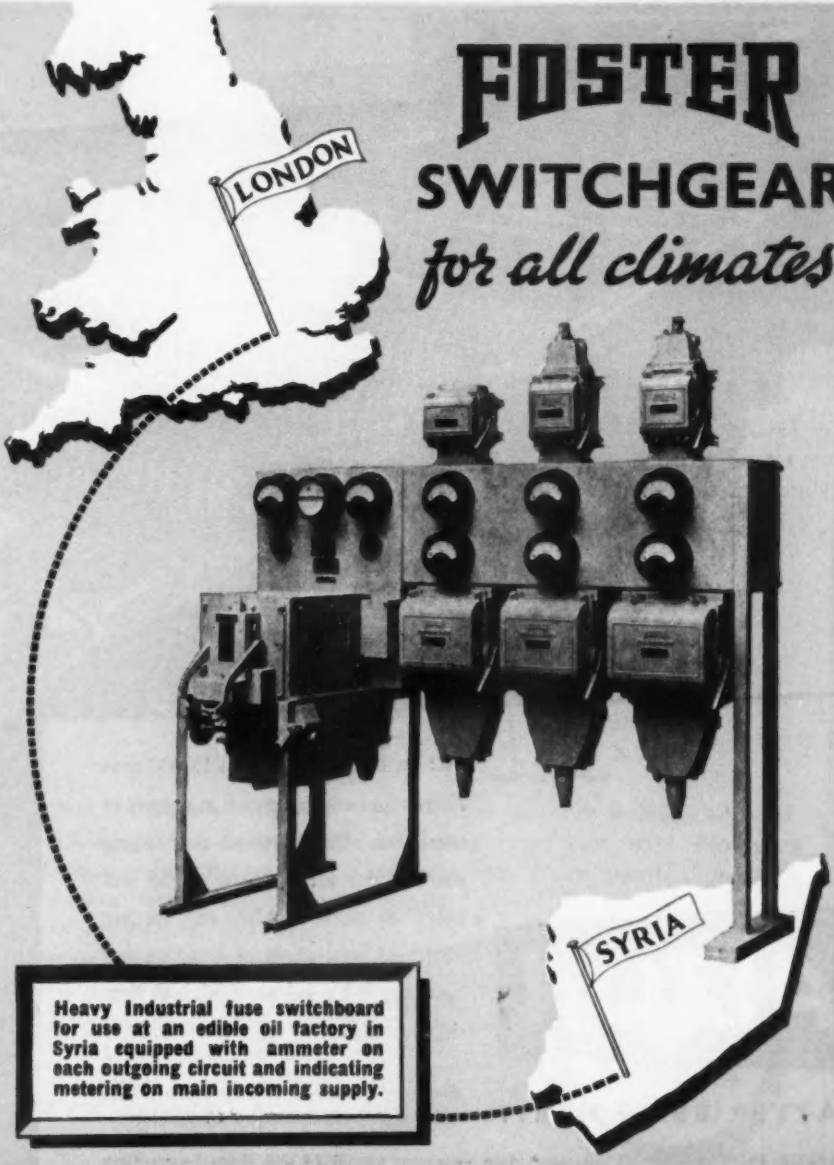

Heavy Industrial fuse switchboard for use at an edible oil factory in Syria equipped with ammeter on each outgoing circuit and indicating metering on main incoming supply.

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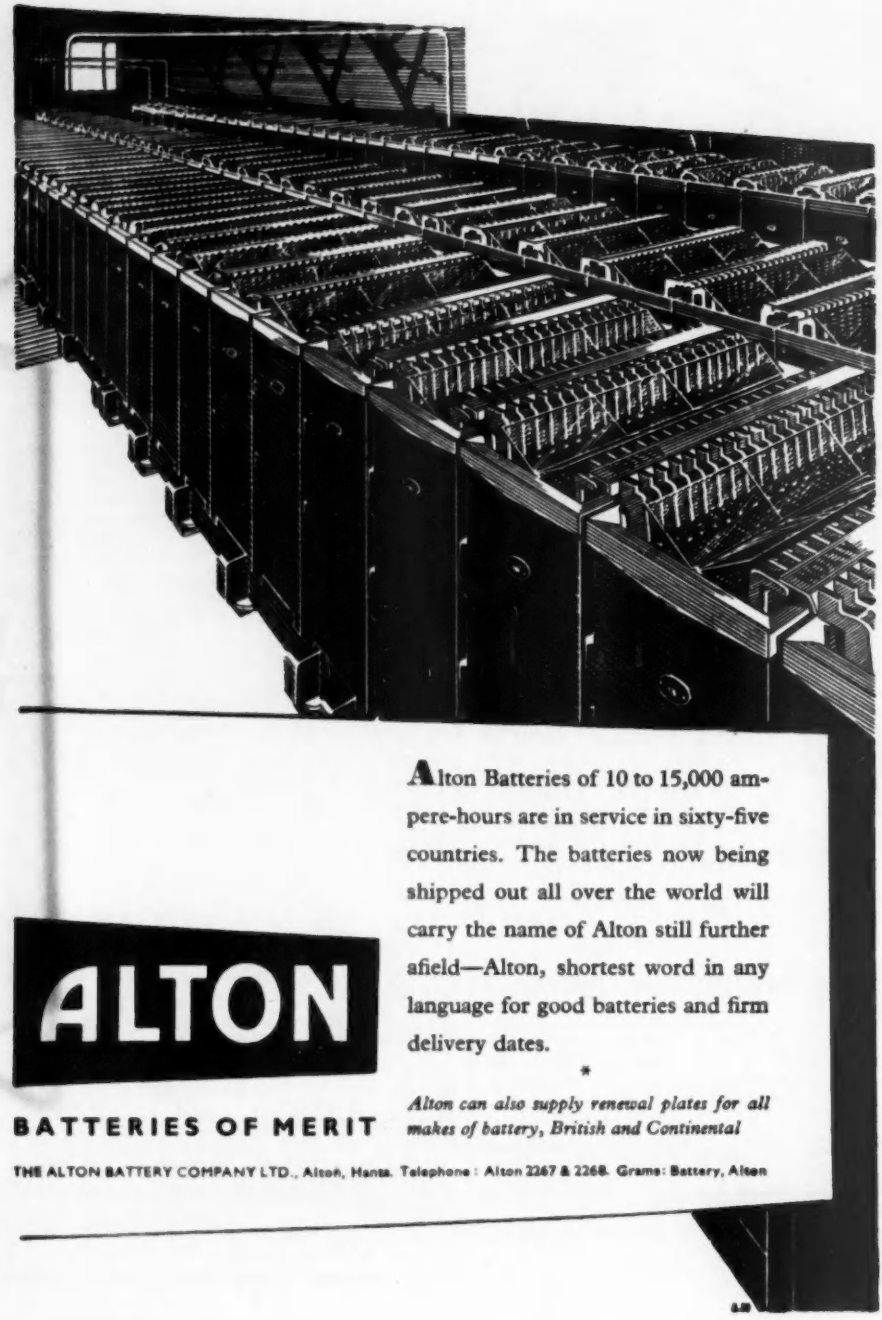

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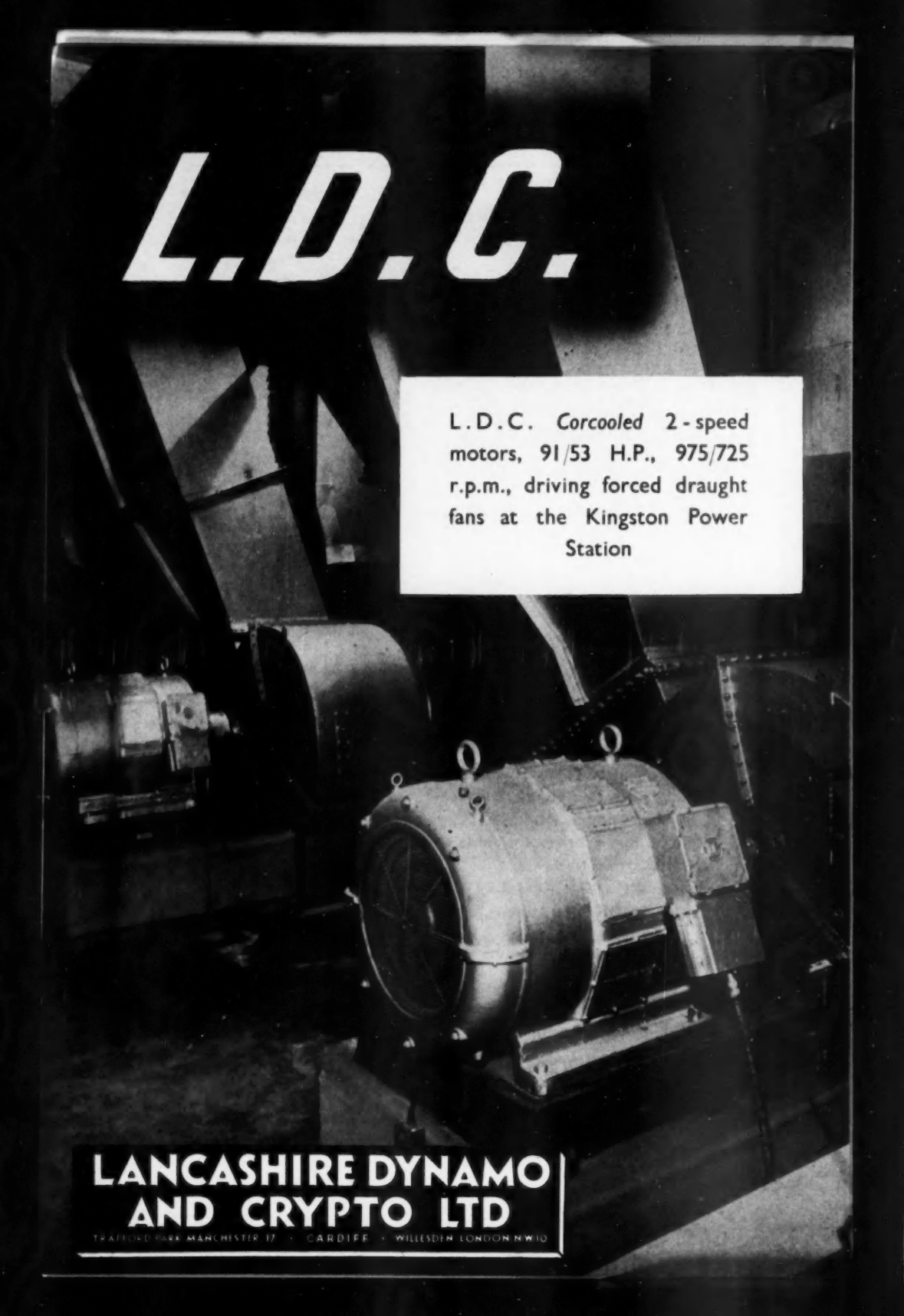
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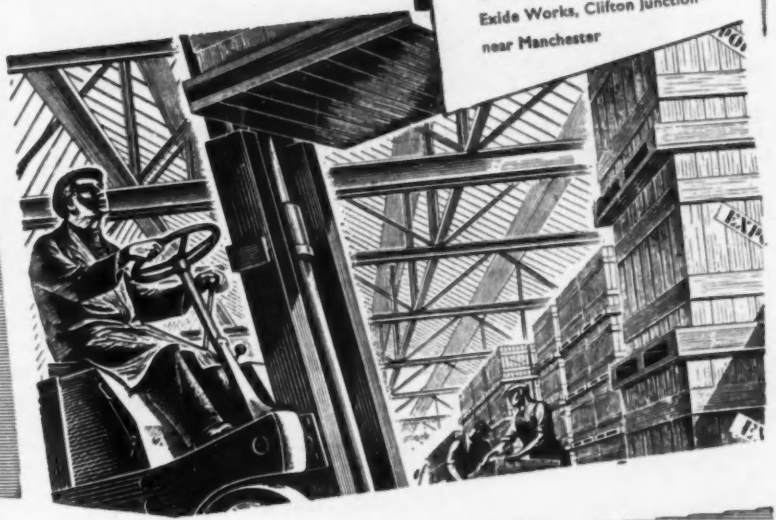
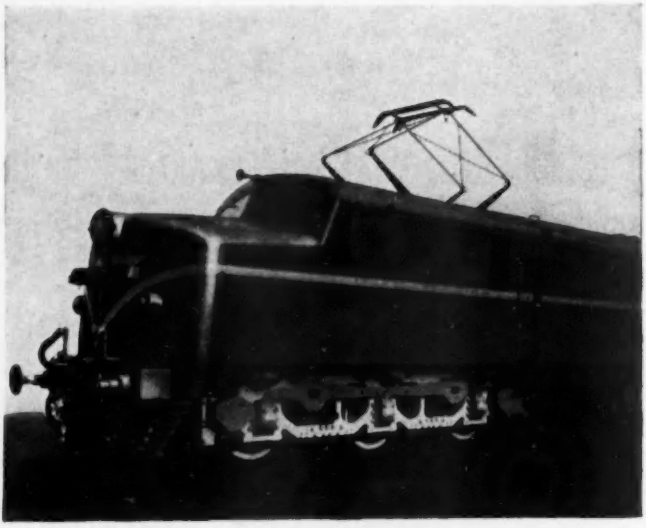


The switch will trip when Exide Switch Tripping equipment is installed

P.378



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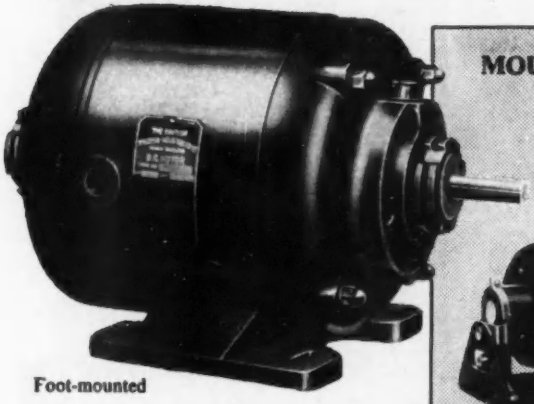

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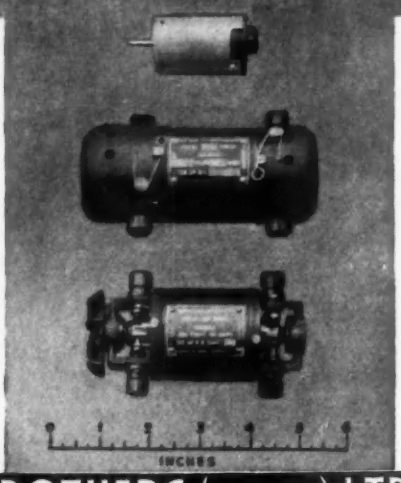

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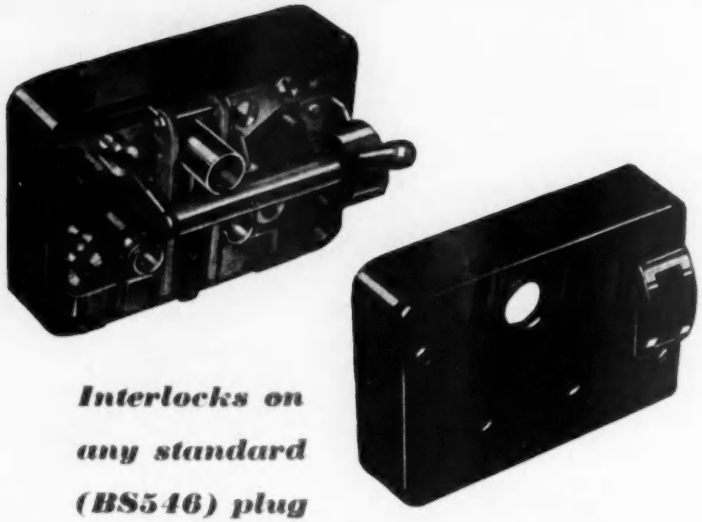

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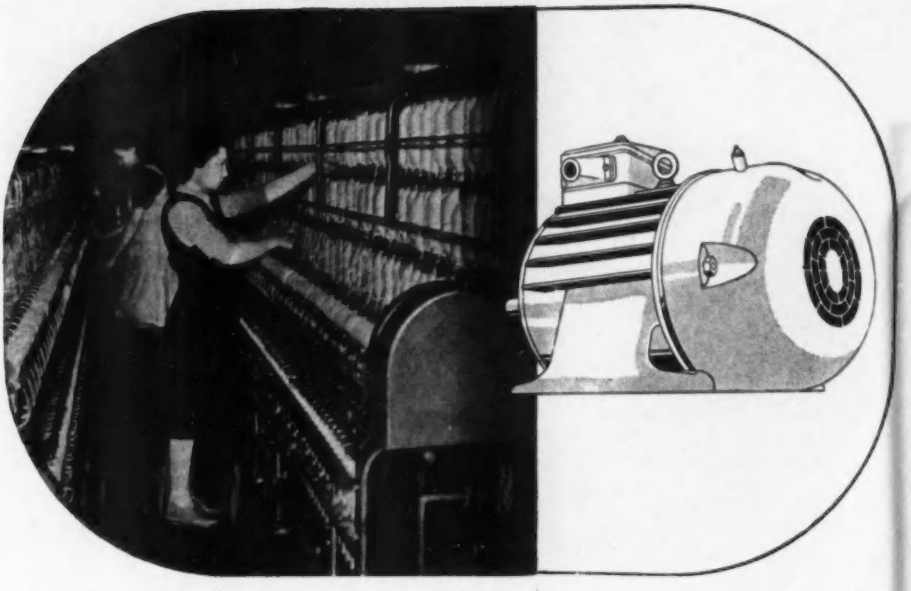

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120,000 buyers throughout the world began to receive personal invitations.

THROUGH THE WINTER
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IN THE NEW YEAR
27,000 advance *catalogues were sent exclusively to buyers abroad.

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10,000,000 pieces of printed information had been distributed within business communities overseas.

★

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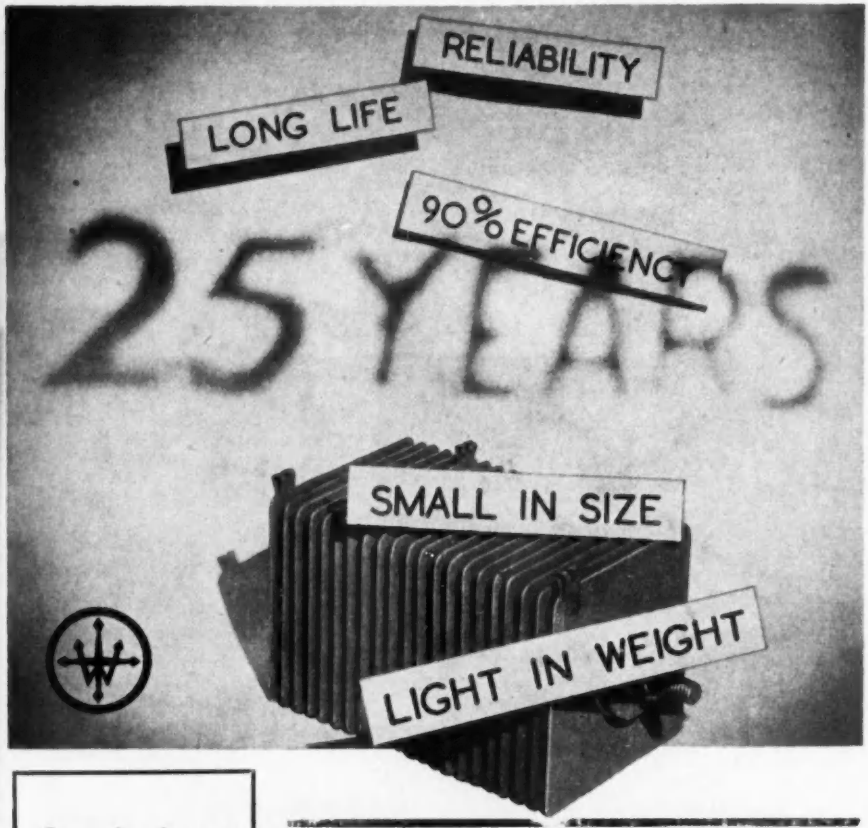

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"Without looking at the name, you can tell it's a Wylex job!"

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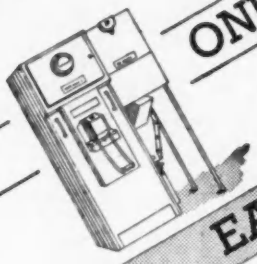
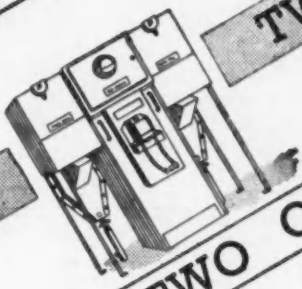


ONE EACH SIDE



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OR TWO ON THE

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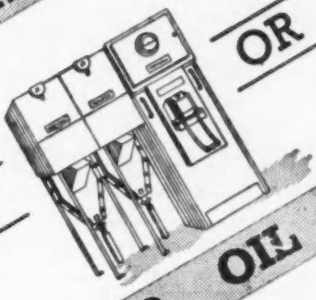

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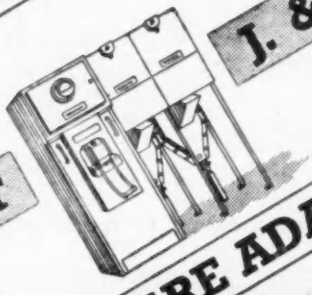
RIGHT



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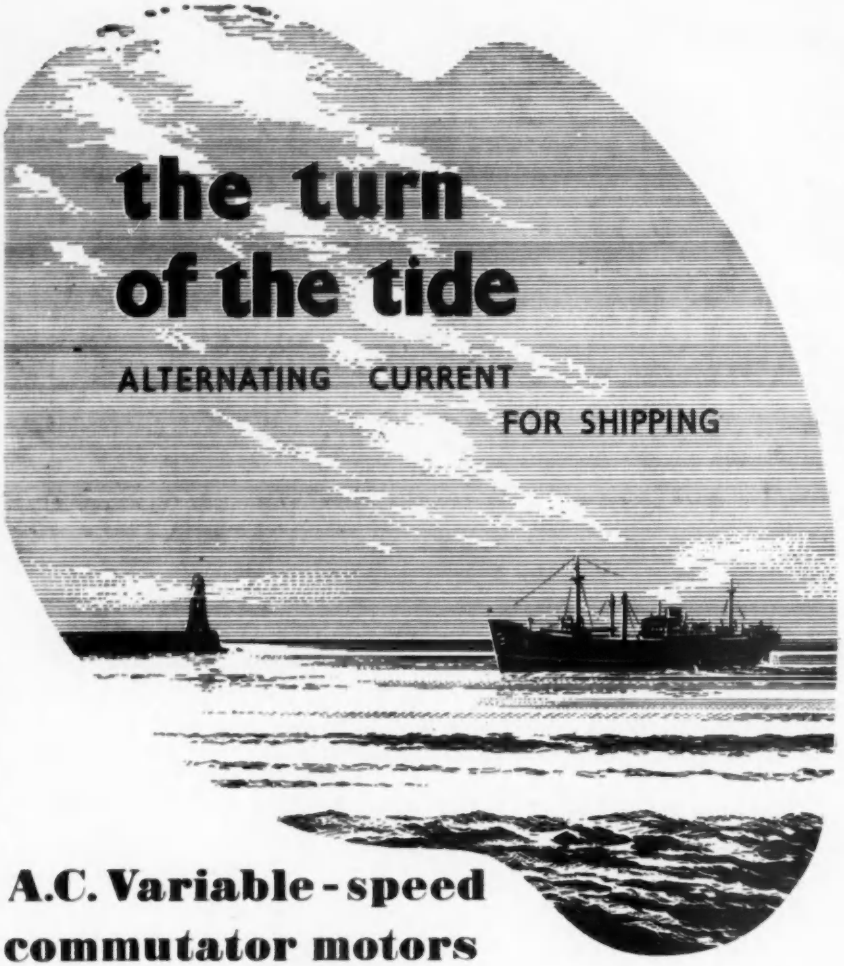

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Standardised dimensions to B.S.S. standards

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ELECTRICAL TIMES

Vol. 117 No. 3049 THURSDAY, 13 APRIL, 1950

PUBLISHED EVERY THURSDAY

FIFTY-NINTH YEAR OF PUBLICATION

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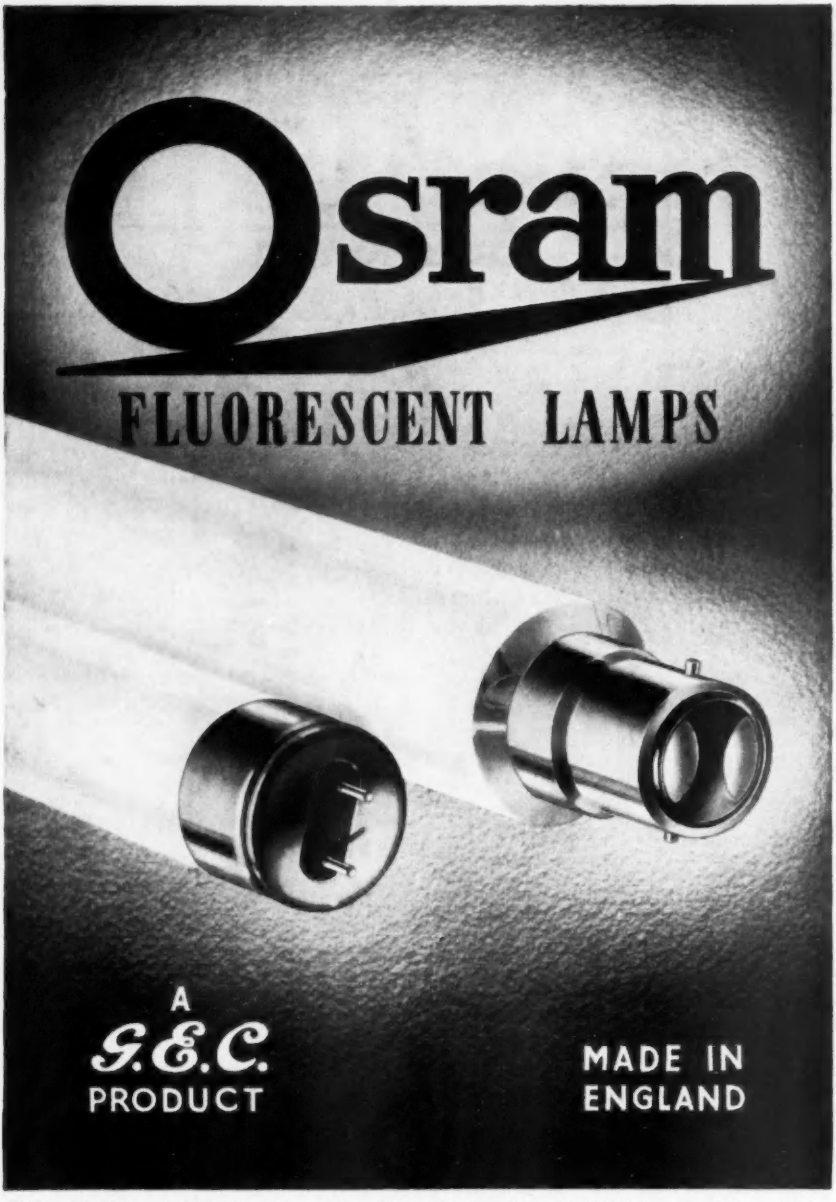


THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

TO VOLTAGE . . . 5%

BEHIND the development of the new silica-coated lamp lies an interesting story. U.S. research workers found that the coating operation helped to "clean up" the inside of the bulb so that it was possible to use a higher proportion of argon for filling, without running the risk of internal flashover across the filament leads. This gave sufficient increase in efficiency to neutralise the absorption in the silica coating, so that the new lamp while giving better diffusion had, in effect, zero loss. Unfortunately, we in this country use 240 V as against the American standard of 110, and the inhibiting effect of the silica is not sufficient to prevent flashover if the argon content is increased much over the normal. We should, however, be content that British manufacturers have given us a lamp with a bulb brightness of something of the order of one-sixteenth of that of the frosted lamp, with a light loss of only 5%. It is a small price to pay for such a spectacular reduction.

WHAT! NO FITTINGS?

A POINT which does not seem to be generally realised is that a reduction in lamp brightness of this order brings a bare bulb almost within the higher limits recommended by the I.E.S. for the maximum brightness of diffusing fittings. Lest this should cause uneasiness amongst fittings manufacturers, however, let us remember three things. Firstly, that those who use a bare bulb from choice are the type who would not buy fittings in any case, and would (and frequently do) cheerfully use a clear bulb. Secondly, that a considerable body of opinion considers that the I.E.S. limits are already on the generous side for average applications. Thirdly, that the new lamp is still two or three times as bright as a fluorescent tube, yet there is a current trend against the general use of bare fluorescent tubes. The new lamp will not, therefore, start a "Back to Bare Bulbs" campaign. Its sole ill effect from the industry's viewpoint will be to render tolerable a large range of lighting fittings which should have been scrapped years ago.

ONE "R" LESS

LONGHAND arithmetical calculations are anathema to the average engineer, his dislike being symbolised by his slide rule, which can give him an answer within the accuracy required with the expenditure of little mental effort. It is not surprising, then, that faced with the threat of a multitude of vector calculations to perform, British network analyser engineers should turn their minds to the production of an automatic computer. That described on page 589 should be useful in all laboratories and design offices where symmetrical components have to be handled, and by saving time and improving accuracy should rapidly pay for itself. It is yet another example of the advantages of the c.r.o. with its geometrical display presentation over pointer type instruments, and of the need for "power" engineers to appreciate the possibilities of such devices.

INDUSTRIAL ELECTRONICS

THE use of electronic devices in British industry has not developed with anything like the rapidity which has been apparent in the U.S. This, of course, is easily understood when the temperament and outlook of American and British engineers are compared. Novelty, which always attracts the American, has just the opposite effect on his more conservative confrere, who always wishes to see a new device proved before he will consider its adoption. This cautious

approach is occasionally responsible for a missed opportunity; on the other hand, it often saves its possessor from a great deal of trouble in respect of an appliance whose chief merit lies in its novelty and is, in actual fact, a blessing in disguise to the electronics manufacturers as a whole. It is preferable to advance slowly and steadily, consolidating one's position on the way, than to make a too-rapid advance, only to come up against a blank wall of prejudice caused by over-eager acceptance of a device which, however promising it appears in the laboratory, is not properly engineered for industrial application. Only by such slow and steady tactics shall we hasten forward the day when electronic methods are as commonplace as are electric methods today.

THE WIRELESS WIREMAN

LONG before that day arrives, however, we shall be faced with the need for skilled men to maintain electronic devices in industrial establishments. There are two ways in which industry can obtain these men. One involves the additional training of maintenance wiremen in the peculiarities of high-frequency techniques, and the characteristics of thermionic valves and other branches of electronics. The other method is the exact antithesis of this course; consisting in the training of men of the radio mechanic type in the work which is the bread and butter of their 50-cycle brethren. The first method will most probably be found a more practical solution, since few good radio mechanics will be looking for jobs until saturation is reached in the field of television servicing, and that is not likely to be yet awhile. Whichever method is adopted, however, the maintenance wireman of the not-too-distant future will need a wider technical knowledge than his chief did 20 years ago, and, if he is wise, he will commence to acquire this knowledge as soon as possible.

SHORTED WHOLESALERS

A READER from the North raises the topic of wholesale distribution in our correspondence columns this week, and puts his finger on a very sore spot so far as many in the trade are concerned. This concerns a practice, indulged in by certain manufacturers, of delaying the wholesaler's quota of supplies—or even samples—until his own travellers have thoroughly covered the ground. Obviously, every manufacturer has a right to determine his own selling policy, and to employ direct representation to any extent he pleases, or finds economic. What he should avoid, however, is to delay supplying the wholesaler either deliberately or inadvertently, until he has himself skimmed the cream from the market or even saturated it. This policy will not, in the long run, lead either to increased sales or to harmonious relations within the trade.

Meteor

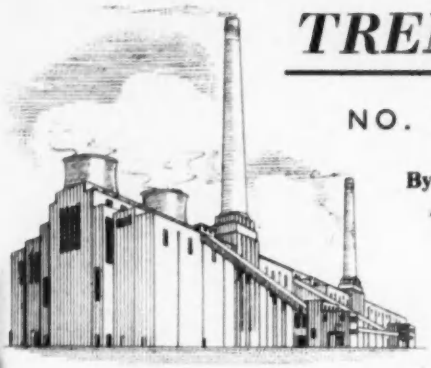
THIS WEEK'S PHOTO

THE PRESENT Newton Abbot power station, under the ownership of the Torquay Corporation, was officially opened by the late Sir John Snell, C.B.E., on September 16, 1924. The original power station, started up in March, 1898, was owned by the Urban Electric Supply Co. Ltd., who operated the electricity supply undertaking at Newton Abbot. The Torquay undertaking, some six miles away, had their own generating station in a restricted site, which precluded extension. The Corporation therefore acquired the company undertaking on May 1, 1923, and thereby obtained the generating station site which, at that time, had an installed plant capacity of 520 kW. This plant was entirely replaced by a new 3,000 kW turbo-alternator and some of the older plant from the Torquay power station. A further 3,000 kW machine was installed in 1925, followed by a 7,500 kW set in 1928 (at which time the station's first coal handling plant was installed), and a similar unit in 1931.

At the direction of the C.E.B., the first h.p. machine of 15,000 kW was commissioned in 1943. In July, 1948, the second 15,000 kW set came into service and represents the envisaged limit of the site development. There are three sections of plant: h.p., m.p. and l.p., the turbine stop valve steam conditions being: h.p., 400 p.s.i., 800° F.; m.p., 250 p.s.i., 700°F.; l.p., 150 p.s.i., 515°F. All the turbo-alternators were made by B.T.H., and the boilers are of Stirling manufacture, the capacities ranging from 25 to 100 klb/hr., and chain grate stoking being employed.

Visible in our picture, on the far side of the railway from the power station, is the 132 kV grid substation. Immediately behind the station is Osborne Park, which was requisitioned by the Mines Department during the war as an emergency coal store. This has now been handed back to the local authority to be used again for its original purpose, i.e., a recreational ground.

ELECTRICAL TIMES POWER STATION SERIES
No. 50.
Newton Abbot.



TRENDS in DESIGN

NO. I. POWER STATIONS

By F. W. LAWTON, M.I.E.E., M.I.Mech.E.
Divisional Controller, B.E.A. Midlands Division

Economic Considerations

THE influence behind the trends in modern steam power station design should be examined before discussing the trends themselves, which are, after all, a secondary reaction.

Of first importance is the price of coal, which on the average has risen from 14s. 10d. per ton to 43s. per ton since 1938, an increase of no less than 189%. It will be reasonably accurate as a general statement to say that the economic overall thermal efficiency in this period should rise from 23% to 69% on the basis of coal price alone. Thus the trend towards higher efficiency is a financial necessity.

It should, however, be realised that even with the higher steam conditions now contemplated with re-heat or in combination with the gas turbine cycle, practical efficiencies approaching 70% are by no means likely. It is therefore reasonable to assume that the contemplated increase in overall thermal efficiency of power stations cannot hope economically to offset the actual increase in coal prices.

Again the price of power stations has increased from, say, £20 to £50 per kW for comparable plant including civil works.

These are the two principal economic forces that have been at work behind the scenes and are largely responsible for modern trends in power station design. The shortage and indeed the high cost of technical and skilled labour has probably for the first time caused the designer to look more carefully into plant lay-out as a science distinct from plant design.

The personnel engaged in power station operation and maintenance even on stations of comparable size varies greatly from, say, 1·2 to 4·5 men per MW installed. The main causes for such large variations in personnel are: Lay-out, selection and design of plant, character of fuel burnt, restrictive local labour practices and variations in the amount of overtime worked by manual workers.

It will be realised that a purely academic comparison of power station performance is futile, indeed a true comparison is difficult even if all the relevant factors are known and taken into consideration.

Steam Conditions

Perhaps the most spectacular amongst the modern trends is the increase in steam temperature to 1,050° F. and pressure to 1,500 lb/sq. in. which even with cooling towers should give an overall operating efficiency based on units sent out over the whole year, of over 31%. This compares with 26·5% for stations operating with steam at 800° F. and 650 lb/sq. in. with the same size machines of the order of 60,000 kW operating with cooling towers.

There is a decided trend towards 100 MW turbo-alternators with boilers of 1,000,000 lb/hr of steam evaporation to conserve capital costs, whilst hydrogen cooling of alternators for machines of 50 MW and over is likely to become in this country standard practice in the near future.

Large ferro-concrete cooling towers of, say, 4,000,000 g.p.h. cooling capacity are already constructed, and capacities of 5,000,000 and over are now contemplated. These towers exceed 320 ft. in height and are no less than 200 ft. in diameter at the base, and constitute a major civil engineering achievement.

Closer attention is being paid to the internal irrigation system to prevent carry-over of water particles, particularly where cooling towers are constructed in built-up urban areas. The average economic vacuum for large concrete cooling tower stations in this country is about 28·25 in. Hg.; at least twice the cooling tower capacity would be required to produce a vacuum of 28·75 Hg.

Some form of standardisation to speed construction and reduce prices will undoubtedly

be put into effect by agreement with the British Electricity Authority and the several manufacturers' organisations. Already terminal steam conditions together with turbo-alternator sizes have been agreed and specified in British Standard Specifications for steam turbines as follows:—

850° F./600 lb. per sq. in., 30,000 kW sets.
900° F./900 lb. per sq. in., 60,000 kW sets.

Fuel Characteristics

As steam temperatures increase, closer attention to the characteristics and uniformity of fuel becomes necessary particularly in the matter of ash fusion temperature. Fuel characteristics are (or should be) the dominating factor controlling the design of boiler and burning equipment, and long-term arrangements for fuel are necessary in order to establish the economics for any particular design. The trend in boiler design is therefore influenced by the fuel to be burnt. In the Midlands, for example, boilers of over 500,000 lb. evaporation at 1,050° F. are under construction or in prospect with both dry and wet bottom furnace designs.

With high steam temperatures superheat control becomes important, and indeed critical. Damper control allied with tilting burners, inert gas re-circulation, or steam de-superheaters, are amongst the present methods of temperature control.

The increasing use of high steam conditions associated with large boilers and machines will undoubtedly cause consideration of the special design of two-shift operated stations involving lower steam temperatures and pressures with smaller machines of, say, 30 MW capacity arranged for quick starting. Expensive high load factor stations with turbo-alternators of 100 MW capacity with 1,000,000 lb. evaporation boilers having welded steam pipes, will alter present maintenance methods.

Boilers

Speed of overhaul is essential and must therefore be carefully planned and organised in advance of shut down. As boilers are not interconnected, the boiler and turbine become a single unit and any overhaul programme must include both, and should be put into effect concurrently.

For boilers exceeding 250,000 lb. evaporation pulverised fuel is generally used. Below this capacity the normal chain grate stoker is satisfactory. The spreader stoker is being fitted to boilers of 300,000 lb. evaporation in America, where also the cyclone burner is being developed for use with high ash content fuels low in sulphur.

The slag tap furnace is not likely to be successful for two-shift working. Moreover, fuels of uniform characteristics are required for these furnaces. It is therefore clear that boiler design will vary with fuel characteristics and operating conditions, and that general uniformity is most unlikely.

Standardisation of turbo-alternators and condensing plant is more likely than standardisation of boiler plant, both steam and electrical conditions being more uniform than fuel characteristics.

Generation voltages exceeding 11,000 volts are not likely to be extended, as most large generating stations will be interconnected to the Grid system.

Having regard to the growing limitations of new power station sites, and the high cost of power station construction, copping turbines are likely to be increasingly considered in many existing power stations containing suitable low-pressure turbines capable of operating under base load conditions. The existing circulating water system could be used with a relatively small addition to fuel requirements.

Re-heat cycles are not making rapid headway at present, but if fuel prices continue to rise, such plants are likely to increase in number when they can be operated under base load conditions.

Power station design is also influenced by operating conditions. For base load a more expensive high efficiency plant can be selected which requires uniform loading conditions for its successful operation. The location of these peak load plants would require to be chosen with great care and have regard to system loading and transmission line capacity.

For two-shift or one-shift stations lower steam conditions and smaller machines would be more flexible. These stations should be cheaper to construct than the base load plant and should also be simpler in design and easier to operate.

Design in Lay-out

Power station lay-out, as distinct from plant design, is at length receiving more competent consideration, as it is now recognised that a satisfactory lay-out can influence the safety and speed of operation and reduce the number of operating personnel required. It will generally be found that the more complicated the lay-out the less consideration has it received, particularly in the early project stage. Only if an entire project is laid out in detail at the outset

can provision be made for all eventualities. Now that generation is on a national basis more orderly and satisfactory lay-outs should be possible, as complete projects can be planned with greater certainty than hitherto. The trend in power station lay-out should therefore be towards simplicity, which generally means lower capital and operating cost. Uniform boiler and turbo-alternator plant throughout the entire station is another aid to low operating costs and saving in personnel.

Building Design

Whither power station architecture? Gone are the decorative ornamental features of the past, which are lost in the vast height and size of modern power station structures where only the contour predominates. Slowly but surely a style of power station architecture is evolving, based on plant lay-out and not on contemporary architecture. Building materials may change but the contour remains clear and distinct with the beauty of truth.

For buildings so vast in size it is doubtful if corrugated iron sheeting would be cheaper than brickwork in the long run, as maintenance and replacement would be considerable throughout the life of the plant. Moreover, if suitably designed, a building can be used to house plant replacements at obsolescence without material change.

There seems little doubt that building design will be tested again and again on the anvil of economics, and evolution of building design will follow in the wake as new materials become available. Bricks were used long before the Israelites were in captivity in Egypt over 3,000 years ago, and are still in fashion, yet a persistent shortage of bricklayers would alone cause substitutes to be sought.

Notwithstanding all personal prejudice, all artistic fashions, it seems inevitable that sheer economics in its widest and most durable sense will control power station building design. The same may be said of plant design. The final arbitration is economics, which is as ruthless as the laws of nature, that will not alter in obedience to the opinions or wishes of men.

Our readers' views . . .

The Wholesale Flywheel

YOUR comments under the above very apt heading are timely and well advised, and manufacturers should take note. Those who are trying to cut out the wholesaler are helping to bring about that to which they as industrialists are bitterly opposed, i.e. the complete nationalisation of industry.

Small contractors in the country districts and small towns cannot get all their requirements from their wholesalers. Take, for example, electric washers. I know for a fact that certain wholesalers are awaiting some for their customers, but are not getting what they were promised. I also know that in the same district a departmental store received nine which were not ordered. Although these were sent back, there has been no sign that the wholesalers' quota is coming through.

This means that contractors who, having carried out wiring jobs, and also had the chance to supply an appliance, cannot get it in reasonable time from the wholesaler. This is not at all helpful to the small independent contractor, who thus loses prestige with his customers, who then tend to give their work to the large town contractors.

If this goes on, the electrical trade will be either completely nationalised or monopolised, either condition being an unhealthy state of affairs as far as efficiency and utmost benefit to the public is concerned.

"*A Sales Representative*"
DARLINGTON

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Commercial Engineers

MAY I, as an interested party, be permitted to give my views on the letter under the above heading. "Consumers' Engineer" persists in referring to "distribution engineers" when surely he knows that the original "Tree" set out for district staffing within the nationalised industry made provision for the following: "District Clerk," "District Commercial Officer," and "District *Engineer*."

Apparently, only one of these three section heads was intended to be responsible for engineering matters, and *all* engineering matters were to be his province.

It is strangely significant that several districts (to the writer's personal knowledge) manage to function with "commercial officers" who have no engineering training.

"*Assistant District Engineer*"
YORKSHIRE

Commercial Engineers

IN REPLY to the letter under the above heading, I see no reason for "Consumers' Engineer" to feel "degraded." Surely the reason that the distribution engineer gets a little more pay is because his duties are more onerous. His status is the same.

The "double harness" referred to gets unhitched when the office closes and the distribution engineer has to be on call even when he is asleep; indeed, that is why so many distribution engineers have cultivated the flair for "matters commercial" and, like your correspondent, transferred to the consumers' engineering side.

To say the future of the industry rests with any side of the undertaking is a complete fallacy. All "Consumers' Engineer's" ingenuity would be in vain unless his opposite number on the distribution side is prepared often to sacrifice personal freedom and comfort in order to ensure the reliability of the service it is "Consumers' Engineer's" job to sell.

Finally, I would add that having heard the immediate past president of the E.P.E.A. speak on the negotiations just concluded, I am convinced that they have done a difficult job well.

"Engineer"

SOMERSET

◆ ◆ ◆

THE letter by "Consumers' Engineer" in your issue dated 23rd March, does not go far enough in pressing for recognition of the position of consumers' engineers in the electricity supply industry. The work of district engineers is rapidly becoming "rule-of-thumb" and planning of new distribution, whilst originated at district level in many cases, is usually checked and re-checked by sub-area and board headquarter's engineers before approval is given.

The consumers' engineer, on the other hand, is required to have knowledge of the district engineers' problems and, in addition, is expected to be able to advise industrial consumers and to speak with authority on all conceivable applications of electricity from electronics to electroplating, besides handling all the complicated business of sales, deferred terms, tariffs, exhibitions, shows and the specialised subjects of horticulture and agriculture.

It would be more to the point, however, to draw attention to the serious reduction in reward for responsibility which the new schedule gives. Taking for comparison a Class G undertaking, the qualified engineer starts his career now at a salary 80% above that possible pre-war, while the district engineer and consumers' engineer can hope for only 30% above pre-war. Compare this with the figures just published in the "Ministry of Labour Gazette," of the average wage for manual workers, which is now 225% above pre-war.

What encouragement is there here for young men to enter the industry and spend several years of their spare time in study?

"Consumers' Engineer"

STAFFORDSHIRE

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THE immensity of the pseudonym "B.E.A. and E.P.E.A." beneath the letter appearing in your issue of 30th March, probably explains the offensive terms of the reply to the earlier letter from "Consumers' Engineer."

Engineering knowledge, experience and skill is one thing, and the commercial equivalent is another. I believe I am right in stating that engineers invested the commercial men with the word "engineer" and subsequently referred to them as "consumers' engineers" or "commercial engineers." Their correct description is "commercial officers" and these function (*i*) at the Central Authority as commercial manager, deputy commercial managers and assistant commercial managers; (*ii*) at area board level as chief commercial officers; (*iii*) at sub-area level as sub-area commercial officers; and (*iv*) in the double-headed organisation in districts as district commercial officers.

It is not a question of comparing the details of the work carried out respectively by the engineers and the commercial officers. Both are essential to the efficient management of the industry and their value must be judged accordingly. The commercial officers would not presume to determine the remuneration to be paid to the engineers, who might at least accord a similar courtesy to the commercial men. The person who writes as "B.E.A. and E.P.E.A." is, on his own admission "neither a district engineer nor on the consumers' side," and seems to think that he is, therefore, the best judge of both. Does any responsible person agree?

"Commercium"

LONDON, N.W.

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IN reply to "B.E.A. and E.P.E.A.," I would say that to compare the usefulness of district engineers to commercial engineers (or officers) or whatever they may be called, is quite irrelevant. What is meant by useful anyway? They both serve the industry and the public in entirely different spheres.

The district engineer's functions are fairly clearly defined and do not vary to any great extent between districts. This is by no means the case with the district commercial staff whose duties and responsibilities vary considerably, both in area boards and even in sub-areas and districts. At one end of the scale the consumers' engineer may have a fairly narrow field of work—meters, services and tariffs—whilst at the other end he will, as a district commercial officer, be wholly responsible for all commercial matters including a large trading organisation and contracting business. He will be responsible for all purchasing and his turnover may well exceed £100,000 per annum. He is, in fact, the commercial manager of a good-sized business and bears a heavy responsibility as his ability, or otherwise, can influence the pocket of his board to the extent of thousands of pounds a year.

It would thus be foolish to pay commercial staff solely on the basis of their engineering duties, although even on this score many are well able to hold their own.

To sum up: in some districts, perhaps, the district engineer should be paid more than the consumers' engineer but in the case of a district commercial officer with full responsibility it seems obvious that the reverse should apply. To put them both on the same schedule, with grades having no regard to their respective duties, seems absurd. Fortunately, it seems that district commercial officers will be divorced from the new N.J.B. schedule and this, perhaps, will make "B.E.A. and E.P.E.A." happy.

District Commercial Officer
NORTH LONDON A.M.I.E.E.

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I BEG space to reply to "Consumers' Engineer," Kent, in your 23rd March issue. I do not think anybody, including the commercial people, realise the measure of responsibility which the distribution engineer carries over and above the actual visible amount of work he turns out.

When "Consumers' Engineer" goes home at night he can, if he is so minded, throw off his worries till next morning—no stand-by for him; the mainsman is left virtually in charge of all outside the generating station. This alone entitles him to a higher grade than his opposite number.

Because the work of the mainsman is never in the public eye unless the supply is off, there is a tendency for non-power engineers to question whether he is really necessary. However, your correspondent does admit grudgingly that they are, in this case.

I think it is the height of presumption to assume that *only* commercial supply people ensure satisfied consumers; this, of course, is what they are paid for. What about the efforts of all the others concerned, including private manufacturers and contractors?

If my friend does not value the valiant efforts of the Electrical Power Engineers' Association to better his conditions, then he should be ashamed. In my opinion, by comparison, they have already done too much for him for the thanks they get in return.

R. Tweedale
A.M.I.E.E.
ROBERTSBRIDGE, SUSSEX

◆ ◆ ◆

ONE would have thought that before making such statements about the competency of consumers' engineers, as engineers, "B.E.A. and E.P.E.A." would have taken care to see that his statements were correct.

The following cases prove that at least some of these men are just as competent as engineers as those who are now district engineers.

1. A man held a highly responsible post as an engineer outside the supply industry, spent three years abroad as an engineer, came home and joined the supply industry as a consumers' engineer, and is now again in the productive side as a substation (h.t.) engineer.

2. A man who was in charge of the change-over from d.c. to a.c. on a large public supply, after filling various other engineering posts in the same Authority, is now a consumers' engineer. This man is an A.M.I.E.E.

3. A B.Sc. (Elec. Eng.), A.M.I.E.E. for the whole of the last war period and until last year, was on the layout and installation of a 5,000 V network and necessary transformer stations, and is now a consumers' engineer.

I am in no way connected with the supply industry but have met these men in the course of my business activities, and as I have met them in an area of about 100 square miles, how many more competent engineers must there be employed in such jobs over the whole of the country?

In the case of agricultural areas where a consumers' engineer may only have to talk to people who have no experienced knowledge, any type of man may do for this position, but in a highly industrialised area, where a consumers' engineer will have to meet engineers who may even be capable of holding the position of a district engineer, he must be just as competent as the district engineer.

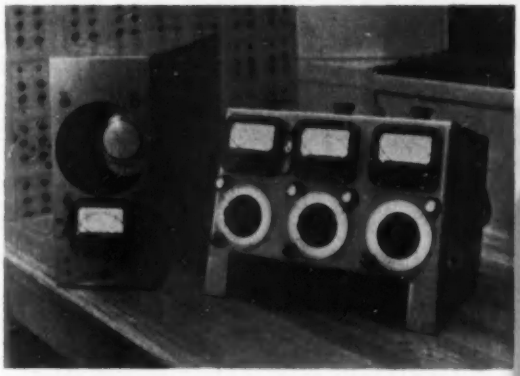
R. D. Holt
SUNDERLAND A.M.I.E.E.

Vector Calculator simplifies Power System Studies

Tedious arithmetical work is avoided by the use of an electronic computer

By D. J. TAYLOR, B.Sc.(Eng.), A.C.G.I.

and K. W. WARDROP, B.Sc.(Eng.), A.C.G.I.*



IT is often necessary in electrical calculations to compute complex or vector quantities. To add and multiply these quantities is a tedious rather than a difficult task, especially if large numbers of such computations have to be performed. Vectors may be expressed in rectangular $(a+jb)$, exponential $(ce^{j\theta})$, or polar (c/θ) forms, the last two being very similar. The rectangular form is the most convenient for addition and the exponential, or polar, for multiplication. If this procedure is followed, then conversion from one form to another is imperative. If some method were available to add the polar form directly, then this form could be used exclusively for addition and multiplication.

This article describes a computer which has been devised to add complex quantities directly when expressed in the polar form, and to evaluate the equations used in various symmetrical component methods. The computer consists essentially of two parts—the computer itself, which performs operations upon the complex quantities, and an indicator unit which gives the answer directly. A schematic diagram is shown in Fig. 2.

The Computer

A vector quantity may be represented electrically by an alternating voltage which is variable independently in magnitude and in phase. If the three-phase stator of a selsyn type motor be energised, then the single-phase winding on the rotor gives an approximately constant voltage output which varies linearly in phase with the rotor position. The output of a potentiometer connected across the rotor thus represents a vector quantity. Such a selsyn-potentiometer unit forms the basis of the computer.

There are three selsyn-potentiometer units in the computer and voltmeters, connected to the variable tap on the potentiometers, indicate the magnitudes which are used for computation purposes. The reference angle of the vector is set on an angle dial mounted on the selsyn-motor shaft. Any regulation or non-linearity effect in the outputs of the selsyn or potentiometer is immaterial as it is the voltmeter reading which is adjusted to the required magnitude. The outputs from these three units are multiplied and added together according to the computation required, and the resultant voltage is presented to the indicator unit.

Indicator Unit

The output from the computer is thus seen to be in the form of a voltage, whose magnitude and phase gives the required answer. To measure this output, the classical procedure is to use a null-point method, e.g. an auxiliary selsyn-potentiometer unit could be used. This is a slow method and the strain involved in close

* *Mr. Taylor is with the B.E.A. and Mr. Wardrop with the A.E.I. Network Analysis Dept.*

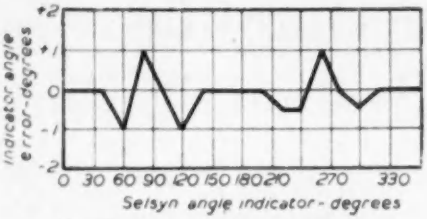


Fig. 1. Phase angle indicator errors

observation of the balance indicator is considerable, so an electronic phase angle indicator was devised.

This equipment operates with any input voltage greater than five volts, and indicates the magnitude and phase angle of the applied voltage, derived from the computer by means of a high impedence voltmeter and a luminous spot traversing a transparent circular scale on a cathode ray tube.

The equipment is supplied from the three-phase source energising the computer selsyns. This supply is used to produce two voltages in quadrature which are applied to the X and Y plates of the cathode ray tube, thus producing a circular scan; under quiescent conditions the circular trace is invisible as the cathode ray tube is over-biased.

The input voltage from the computer is applied to the valve V_1. This valve saturates and gives a square wave output; this is then differentiated by the coupling circuit feeding V_2. The pulse output from this stage is further amplified by V_3, and the output used to trigger a thyratron V_4. The pulse of current so produced in the thyratron cathode circuit causes a pulse voltage to be developed across a resistor, and this voltage is used to modulate the brilliance of the cathode ray tube.

The spot is rendered visible by this pulse, and so the time at which this occurs relative to the scanning voltages, which is indicated by the position of the luminous spot on the circular scale, shows the phase of the input to the indicator unit relative to the three-phase selsyn supply.

Thus, in operation the computer is rapid, for after setting the magnitude and angle dials and switch positions on the computer, it is only necessary to allow a very short time to elapse for the voltmeter pointer to become stationary before being able to read off the magnitude of the output. The angle indication on the cathode ray tube is virtually instantaneous.

Symmetrical Components

To evaluate unbalanced conditions in a three-phase network symmetrical component methods are widely used. These methods necessitate the evaluation of equations relating three vector quantities and having the general form $(ax+by+cz)$ where x, y, z are complex quantities. The evaluation of many thousands of these equations is extremely tedious using

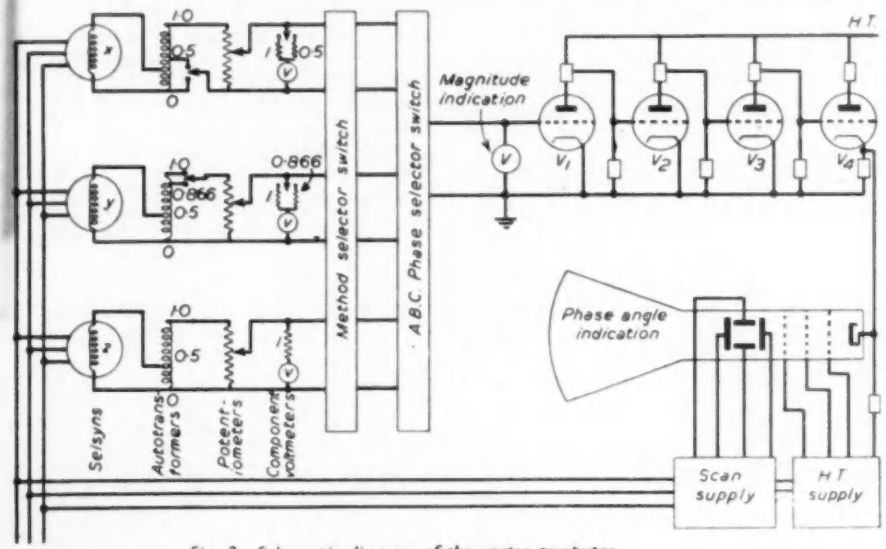


Fig. 2. Schematic diagram of the vector computer

TABLE I.—TYPICAL RESULTS

Type of Fault	Calculated Results						Computer Results					
	I_R		I_Y		I_B		I_R		I_Y		I_B	
	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag.	Angle
Red Phase to Earth	5,727	283	0	—	0	—	5,700	284	0	—	0	—
	5,655	283	0	—	0	—	5,550	284	0	—	0	—
	1,596	287	0	—	0	—	1,580	289	0	—	0	—
	1,270	286	170	105	170	105	1,245	287	165	100	165	100
Yellow and Blue Phase to Earth	0	—	5,900	162	5,900	46	0	—	5,800	163	5,800	44
	192	286	1,360	171	1,360	41	198	288	1,320	172	1,330	40

the normal methods, almost to the point of impracticability.

As is stated in the introduction, the computer has been devised to convert symmetrical components into phase quantities. The equations involved in the various methods used are as follows:—

(*a*) *Straight Summation.* This method is needed for classical symmetrical component methods which give the resultant $=x+y+z$. The three-phase quantities are obtained by a summation of this type, followed by two more where x and y are rotated 120° and 240° alternatively. These equations are evaluated by three settings of the angle dials.

(*b*) *Sum and Difference Method.* If the positive and negative phase sequence impedances are assumed equal then a solution using two networks instead of the usual three may be used. The equations involved in this method are:—

$$\text{A phase quantity} = x+z$$

$$\text{B phase quantity} = -\tfrac{1}{2}x - \frac{j\sqrt{3}}{2}y + z$$

$$\text{C phase quantity} = -\tfrac{1}{2}x + \frac{j\sqrt{3}}{2}y + z$$

(*c*) *Kimbark Components.* For certain types of fault it is more convenient to use a set of component equations due to Dr. Kimbark. It should be noted that x, y, z are complex quantities not necessarily the usual Kimbark x, y, z components. The equations involved are:—

$$\text{A phase quantity} = x+z$$

$$\text{B phase quantity} = -\tfrac{1}{2}x - \frac{\sqrt{3}}{2}y + z$$

$$\text{C phase quantity} = -\tfrac{1}{2}x + \frac{\sqrt{3}}{2}y + z$$

(*d*) *Edith Clarke Components.* For other types of fault the following set of equations are more convenient:—

$$\text{A phase quantity} = x+z$$

$$\text{B phase quantity} = -\tfrac{1}{2}x + \frac{\sqrt{3}}{2}y + z$$

$$\text{C phase quantity} = -\tfrac{1}{2}x - \frac{\sqrt{3}}{2}y + z$$

In methods (*b*), (*c*) and (*d*) the variations between A, B and C phase quantities involve scalar multipliers and in one case a j factor. The j term is introduced by using two cursor indicators on the y angle dial displaced by 90°, selectively illuminated according to the method used. The x half multiplier is inserted by switching to half volts on the selsyn output transformer. The sensitivity of the x voltmeter is simultaneously doubled accurately so that any error in the selsyn-transformer output is indicated and may be corrected. A compensating circuit is also switched at the same time to reduce the regulation of the selsyn unit. The y multiplier is provided by altering the y voltmeter sensitivity so that it reads unity for ($\frac{\sqrt{3}}{2}$ unity) voltage when the $\frac{\sqrt{3}}{2}$ multiplier is to be used. No multiplier is provided for the z unit.

One switch selects the method (*a*), (*b*), (*c*) or (*d*) which is to be used, and the other selects which of the A, B or C phase quantities is to be evaluated, this being indicated by coloured lamps. These lamps are all extinguished when method (*a*) is used. The final output is taken from the computer to the indicator units by a plug lead and is also available on terminals for test.

Conclusion

The accuracy of the computer is about $\pm 1\%$ in magnitude and $\pm 1°$ (as shown in Fig. 1) for each x, y and z component and all the multipliers. An overall figure of accuracy is difficult to estimate owing to the diverse manner in which the components are added together. During commissioning tests typical examples were evaluated by the computer and gave good comparison with exact evaluations. Typical results are shown in Table 1. The time saved by this device is considerable as many results have to be evaluated, and the ratio of the time for manual computation to that for computer operation is of the order of 12 to 1.

The authors wish to thank A.E.I. Ltd. for permission to publish this article.

Problems and Practice

IN ENGINEERING

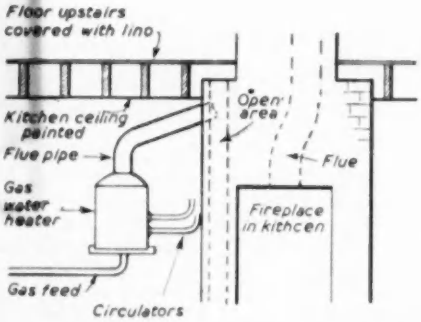
Gas was the Trouble

A COMBINATION of faults over a number of years very nearly resulted in serious trouble. The occupants of a house noticed that the electric lights in the rear of the house behaved very peculiarly when the gas water heater had been on for a short time in the kitchen.

On one occasion the occupant upstairs smelt burning rubber and immediately pulled up the lino, to find that the floor boards were saturated with water, and smoke as well as steam was rising. Pulling up a loose floorboard, it was found that the wiring, in capping and casing, going down to the kitchen light position, was bare and flashing from the sodden woodwork to a gas pipe which originally was the kitchen light.

Immediately, the occupant removed the fuses from the distribution board, but this did not stop the arcing. We were then called in.

It was found that the gas heater had been fitted at least twelve years previously, but the flue pipe from it had been taken into a 'dummy' flue, as shown in sketch, with the result that all the fumes and steam from condensation had passed into the space between the ceiling and floor boards. In doing so it had rotted the covering of the v.i.r. cables exposed at the light entry.

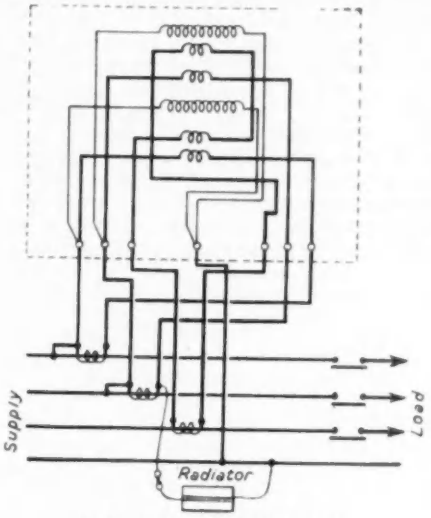


Building details showing how fumes and steam reached the underfloor space and the wiring

A few months previous a 'handy man' had fitted a new distribution board of the single-phase and neutral type for the occupiers. Unfortunately, he had taken the 'live' main to the neutral bar and consequently the lighting was only backed by the 60 amp fuse in the supply department's main switch.—*R. S. M.*

Kilowatts by the Hundred

A FACTORY metered by a 500/5 amp, 3-phase, 4-wire meter, 400/230 V, with loading 300 amp approximate per phase, consumed per winter quarter about 120,000 units, but for one such period an account for 156,000 units was presented. Consumer refused



Radiator and meter connections

to pay stating "no reason for increase." Investigation proved that increased registration was caused by a 1 kW radiator connected as shown herewith. Almost all the radiator current passes through the current coil in meter which, by the multiplying constant, registers it as the equivalent of 100 kW approximately. The maintenance man had connected the fire in his domain, the meter room, and had found the small secondary c.t. terminal so convenient on which to fix the 3/029 for his "comforter." This incident serves to illustrate how trouble is caused by so-called "temporary" connections, and little errors

become big ones. In this case it was thought that by connecting to the secondary, the radiator would be metered; it certainly was !—*G. E. M.*

Dampness Causes Increase in Speed

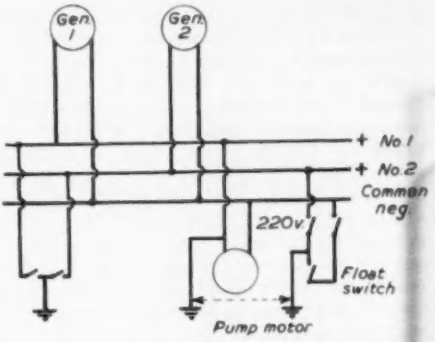
A ONE and a half h.p., 220 V d.c. motor had been installed for driving a paper conveyor. After approximately an hour's run the speed was noticed to have increased and to be increasing further every moment. As the supply voltage was found correct, a variable resistance somewhere in the shunt field circuit was suspected. All connections in the starter and motor connection box were examined and found correct. On dismantling the motor it was noticed that a film of moisture was deposited on the bottom field coil bobbin. The ends of this field coil winding were connected to two terminals situated on a fibre cheek forming part of the bobbin. As the moisture was bridging the two terminals a comparatively low-resistance path was set up in parallel with the field coil winding. Although this effect would cause the total shunt field current to increase above normal, the total resulting magnetism of the shunt field would be decreased with consequent increase in speed. A few enquiries disclosed that the motor had been purchased second-hand and that it had not been dried out before putting on circuit, although it had been stored in a damp room. Apparently heating of the field coil had caused moisture to evaporate and be driven off, but on contact with the colder air due to windage, etc., had condensed and been deposited on the fibre cheek. If the motor had been thoroughly dried out and tested before connecting to the supply, this trouble would not have happened.—*E. A. R.*

Earth Leakage Indication

IN a local brewery, which generated its own supply at 110 V d.c., consternation was caused when the indicator lamp connected to a float switch in the main water storage tank showed a permanently full tank. To add to the general panic a voltmeter placed across the terminals of the switch on the indicator panel showed a p.d. of 220 V. As no one on the spot could interpret these signs we were called in.

A glance at the earth leakage indicator lamps showed that an earth fault existed in the pump circuit which was connected to No. 1 generator, and it was further noted that the "tank full" indicator was connected to one way of the lighting distribution board on No. 2 generator. It was, therefore, reasonable to suppose that a second earth fault existed in the float switch circuit feeding current into it from the pump fault. A "megger" test and a little searching revealed this to be so and the trouble at both points was soon remedied.

It may be remarked that the attendant had banked up the pump fuses solid and these were unbearably hot; his reason being that for some time past he had been unable to keep fuses in. Such a state of affairs might have gone on indefinitely had the second fault not recurred.—*G. W.*



Brewery generator and pump connections, with earth leakage indicator circuit to the left

Bolted Aluminium Joints

WHEN making bolted or clamped connections to aluminium surfaces which must be electrically conducting, it is usual to smear the surfaces with vaseline, clean them with a file or scratch brush, and then with the dirty vaseline in place bolt the surfaces together. This prevents the formation of the aluminium oxide film which would otherwise form in the interval between cleaning and bolting up. However, vaseline is greasy and not all is squeezed out by the bolting pressure. If instead of vaseline a thick paste made from fine aluminium filings and petrol is used, it is quite as satisfactory, and any deposit left will be conducting. —*W. E. W.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be redrawn for publication.

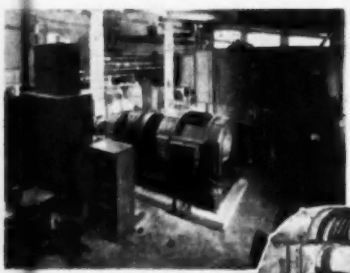
Manufacturing Progress during the year 1949

No. 10—Metropolitan-Vickers Electrical Co., Ltd.

ORDERS for turbo-generator sets were received from various parts of the world, and the year was marked by the dispatch of a number of important units to site, and the commissioning of many others. The second hydrogen-cooled generator was dispatched to Littlebrook Power Station, two 55,555 kVA, 33 kV 3,000 r.p.m. sets were dispatched to Pyrmont Power Station, Australia, two 63,430 kVA 3,000 r.p.m. sets to Croydon Power Station, two 56,250 kVA 3,000 r.p.m. sets to Cliff Quay Power Station, Ipswich, and one 67,130 kVA 1,500 r.p.m. set to the Neepsend Power Station, Sheffield. The first hydrogen-cooled machine for Battersea, the third to be manufactured at Trafford Park, rated at 66,667 kVA 3,000 r.p.m., was completed ready for dispatch, as were two 62,500 kVA 33 kV 3,000 r.p.m. machines for Agecroft Power Station, Salford. Of new plant put in hand during the year the largest is a two-axis unit of 100,000 kW for Battersea "B" Power Station. This set, which will in general be a duplicate of the existing 100,000 kW Metrovick two-axis unit, has a 16,000 kW 3,000 r.p.m. high-pressure turbine exhausting to an 84,000 kW 1,500 r.p.m. two-cylinder condensing unit.

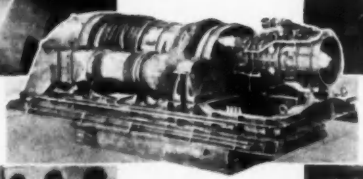
Generators commissioned during the year included the 75,000 kVA 3,000 r.p.m. hydrogen cooled generator at Littlebrook Power Station, which was the first hydrogen-cooled generator to be manufactured and run in this country. It is now operating under normal working conditions, supplying power to the Grid. Abroad there were the three 25,000 kVA 3,000 r.p.m. turbo-generators installed at Catalagzi Power Station in Turkey.

Of the twenty-seven turbine sets ordered, twenty-three are for overseas installations. Perhaps the most interesting are three 30,000 kW 3,000 r.p.m. single-cylinder back-pressure turbines for the Morwell Briquetting Works of the State Electricity Commission of Victoria. These sets will operate with initial steam conditions of 1,250 p.s.i.g., 915° F., and will exhaust at 28 p.s.i.g. The exhaust steam is



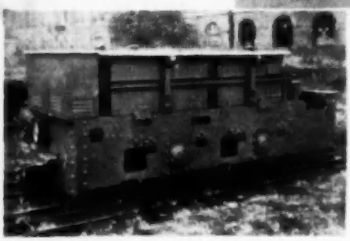
(Left) General view of Ward-Leonard set and control gear for paper machine drive

(Right) Winder for N.C.B. Stella Coal Co.

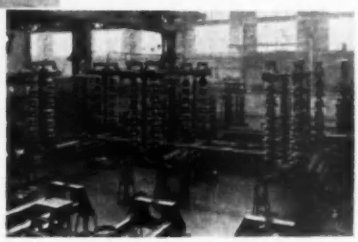


(Below) One of four battery locos delivered to Norway for use in tunnelling

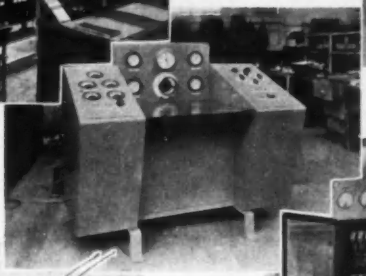
(Centre) 2,000 kW gas turbine for M-V Trafford Park Works in construction



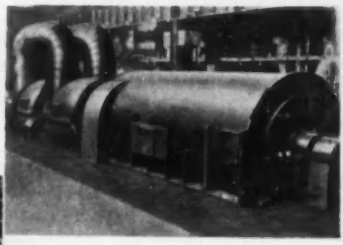
(Right) 220 kV, 3,500 MVA air blast C.D. Type GABT for Finland completed in the shops. The largest air blast breaker built in this country



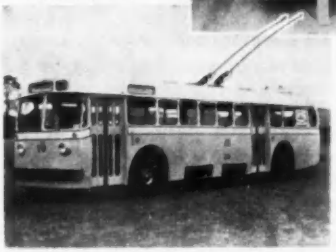
(Above) Turbine control panel with signalling system and load limitation equipment



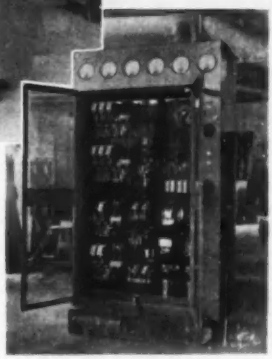
(Right) 75,000 kVA 3,000 r.p.m. hydrogen-cooled generator at Littlebrook Power Station



(Below) One of the 55 trolleybuses for Auckland, N.Z.



(Centre) Control desk for two section paper mill with electronic speed and draw control



(Left) Contactor control cubicle with glass doors for 3,800 h.p. ship winder

used for the drying of small coal for subsequent use in the briquetting works.

Gas Turbine Sets

Orders have been received for two open-cycle gas-turbine driven generator sets from the Metropolitan Water Board and the Shell Petroleum Co., Ltd. The Metropolitan Water Board 2,500 kW installation will operate on gas oil, and is to be used for stand-by power generation at Ashford Common pumping station. The gas turbine for Shell is to be installed in Venezuela, and has a continuous rating of 1,750 kW; it is designed to burn natural gas. Each of these gas turbines includes a fifteen-stage axial flow compressor, and a four-stage turbine coupled directly to the compressor, and driving the alternator through single reduction gearing: no heat exchanger is included.

Several hundred hours operating experience has been obtained with the 2,000 kW gas turbine installed in M-V Trafford Park Works, the first gas turbine to supply power to the National Grid.

Manufacture of the 15,000 kW gas-turbine installation for Trafford Generating Station is proceeding and a 1,750 kW machine is being developed for operation on natural gas.

Water Turbines

All the orders for water turbine-driven a.c. generators received during 1949 came from abroad; they included four generators for Australia and two for Iceland. One is for a 17,500 kVA 600 r.p.m. vertical machine for Kiewa No. 4 Power Station of the State Electricity Commission of Victoria, Australia—the fourth machine ordered for this Station.

During the year the first and the second 18,000 kVA vertical shaft units running at 75 r.p.m. for Tainionkoski (Finland), which were dispatched to site without prior works assembly or test, were erected without serious difficulty, and were immediately put into commercial service. The third machine is being erected.

The first 8,333 kVA 167 r.p.m. vertical shaft machine for Pitlochry (Scotland) has been dispatched from the works, and the second unit is being prepared for works tests. Two identical machines for the Tor Achilty Station of the same scheme are also on order.

One of the three 19,000 kVA 500 r.p.m. generators for Billiton in the Dutch East Indies was also dispatched during the year.

This year has been noteworthy for the number of synchronous condensers completed. Two of 15,000 kVA and two of

30,000 kVA have been dispatched to Spain, a third of 30,000 kVA 15 kV has been completed and tested, and a fourth is rapidly nearing completion. Recent orders include three 30,000 kVA 12 kV machines for Spain, and seven of 20,000 kVA 10·5 kV for the Electric Supply Commission of South Africa.

Transformers

The year was notable for the shipment to Holland of a 100 MVA three-phase, 220/150/10·5 kV three-winding transformer group. This group has been installed at Lutterade, Holland, and links the 150 kV Dutch network to the 220 kV Ruhr network.

Other export shipments include the second 40 MVA three-phase 10·5/126 kV transformer for Tainionkoski Power Station, Finland, and many large transformers for South America, India, South Africa and European countries.

Shipments for the home market have included main substation transformers and generator transformers, including two 75 MVA three-phase 132/33 kV transformers for the B.E.A. substation at Edinburgh, and generator transformers for Croydon and Stalybridge. The generator transformer for Croydon is the first of six which will ultimately be installed there.

Large numbers of overseas orders have been received, many of them being for duplicates of plant supplied previously. In this class are two 20 MVA transformer groups with on-load tap-changing gear for synchronous condensers, and twelve 15 MVA 76-38/6·6-3·3 kV transformers for the Electricity Supply Commission of South Africa.

Switchgear

Considerable progress has been made in the development of air-blast circuit-breakers.

In Finland 110 kV breakers have been put into commission, and the first three-phase 220 kV air-blast breaker supplied from this country has been received. Equipments in manufacture include eight 165 kV and three 65 kV breakers for a Portuguese hydro-electric scheme, and 220 kV and 110 kV breakers for Poland. The B.E.A. ordered more 3,500 MVA breakers similar to those recently commissioned at Cliff Quay, Ipswich, for the new 132 kV station at Carrington.

Motors

Orders for induction and synchronous-induction motors received during the year total about 70,000 h.p. Haulage motors with ratings from 150 h.p. to 250 h.p. were supplied for applications for which adjustable pedestal on bracket bearings and generally robust construction, amongst other things, were preferred.

The demand continues to increase for motors with a closed air circuit, in which the circulating air is cooled by means of water coolers. Motors of this type with ratings as small as 350 h.p. are on order; the coolers are mounted either on top of the motors or underneath.

Applications of the motors ordered include winders, pumps, air compressors, cement mills and motor generator sets. Three 4,500 h.p. 500 r.p.m. salient pole mill motors were completed and tested for the Steel Company of South Wales. The "VAX" excitation control applied to these machines has given highly satisfactory overload characteristics, combined with leading current output for power factor correction when the motors are operating at light load.

Industrial Electrification

A selection of the past year's orders for rolling mill equipments includes a drive for a 48 in. cold reversing strip mill at The Steel Company of Wales Lysaght Works for rolling silicon steel sheets. This consists of a main motor of 2,500 h.p., 93/232 r.p.m., and two reel motors of 1,000 h.p. each, made up of two 500 h.p. 250/650 r.p.m. d.c. motors. The motors will be supplied from two synchronous motor-generator sets, the set for the main mill motor being one 2,600 h.p. 6,000 V synchronous motor driving two 1,000 kW 600 volts d.c. generators. The set supplying the reel motors comprises one 1,400 h.p. 6,000 V synchronous motor driving two 800 kW 600 V d.c. generators (one for each reel motor), and one 200 kW 230 V d.c. generator for auxiliary d.c. power. In addition there are thirteen auxiliary motors totalling 184 h.p. for screwdowns, feeder leveller drive, etc.

There are various equipments for smaller rolling mills on order, among which is the equipment for driving a four-high strip rolling mill at the I.C.I. Kynoch Works, Birmingham. This comprises one 800 h.p. 0/500/1,000 r.p.m. d.c. motor for the main drive, and one 50 h.p. 0/540/1,080 r.p.m. motor for the upcoiler, supplied from one 700 kW transformer rectifier unit made up of two grid-controlled pumpless steel-tank units. The equipment also includes a 6·6 kV "KOC" metalclad draw-out switch unit for control of the primary side of the rectifier transformer, auxiliary motors for screwdowns supplied from a free field generator set, and several other a.c. auxiliary motors with contactor starters.

During the past year the second main mill motor at the Scunthorpe Works of the Appleby Frodingham Steel Co. has been placed in its

final position, and the whole equipment is working quite satisfactorily.

Winding Machinery

Eight 1,350 h.p. a.c. winders fitted with M-V dynamic braking and control gear are to be supplied to Rand Mines Ltd., South Africa. The control gear is formed in two sections for lowering through an aperture 5 ft 2 in. by 4 ft 1 in. The central control desk is equipped with Vernier depth indicators, and a central board groups all auxiliary control gear.

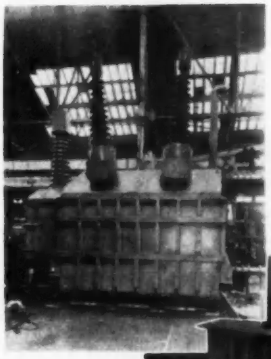
Three 4,500 h.p. twin-motor a.c. winders with dynamic braking are to be supplied to the Anglo-Transvaal Investment Co.; they will be the largest a.c. driven hoists to be installed in South Africa. Repeat orders for four Ward-Leonard winders for their Rhodesian copper mines at N'Changa and N'Kana have been received from the Anglo-American Corporation, and locomotives, rectifiers, overhead and signalling equipment are to be supplied. Eight control equipments, one 3,100 h.p. 72 r.p.m. reversing motor and one 2,300 kW 490 r.p.m. d.c. generator, ordered by the Anglo-American Corporation, are also for the African continent.

Other overseas orders include nine locomotives and a rectifier substation for sand-packing workings in Poland; two locomotives for New Consolidated Coal Fields; flameproof control equipment for Turkey; and a medium-sized winder for Spain.

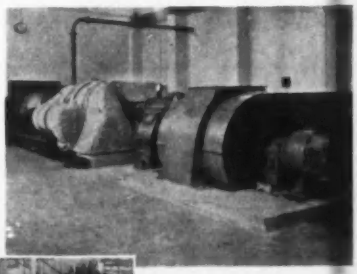
At home, the ten years reliable service of the M-V a.c. automatic hoist at Lynemouth colliery has no doubt influenced the N.C.B. in ordering three further such hoists.

Rope-changing winches have been ordered for use with the Keope winders for the Clipstone and Bradford collieries. Control equipment for the Bradford winder is to be supplied by the Company.

Work is in hand for the control equipment for the automatic skip winding scheme at Mosley Common that (so far as is known) will be the largest winder equipment in the world. The installation is to be carried out in two stages, the initial rating of the winder being 4,500 h.p. (RMS) and the final rating 9,000 h.p. (RMS) working a depth of 3,400 ft. The final equipment will include: four driving motors, deriving their supply from two separate M.G. sets having two generators each; an oil-servo operated Ward-Leonard controller in the generator field circuit, equipped with four sets of face-plate contacts; and automatic load-measuring relays for a load/speed compensation. Automatic control will be initiated by the operation of the skip-loading doors.

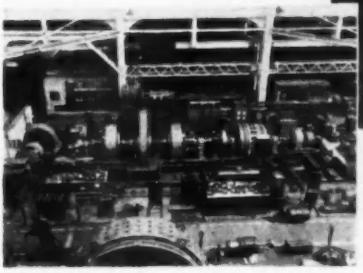


(Right) Transformer complete in tank with h.v. bushings and on load tap changing equipment but excluding cooling plant. One of three single-phase units forming a 100 MVA 220/150 kV 3-phase bank for Holland.



(Above) Gas turbine installation in M-V Trafford Works showing the gas turbine gear box, alternator and exciter

(Below) Flywheel-equalised hydraulic coupling motor generator set for winder for North Broken Hill Co., Australia, shown on Trafford Park test bed



(Above) Infra-red projector

(Right) 3½-ton induction furnace at Sheffield steel works

Dielectric Admittances in C. T's.

Methods of Evaluation Discussed at I.E.E.

THE transformer designer aims to obtain as close an inductive coupling between windings as is practical, with negligible dielectric coupling. The latter, however, is always present in greater or less degree and must in consequence affect the transformer characteristics. The effect of this on current transformers was described by Dr. A. H. M. Arnold in his paper "Dielectric Admittances in Current Transformers" delivered to the Measurements Section of the I.E.E. last week.

Type of Operation Considered

The paper dealt mainly with the case where the dielectric admittance between primary and secondary windings of the transformer or between either winding and earth was not negligible. It was, however, assumed that, as far as external circuits were concerned the dielectric admittances between the primary and secondary circuits, and between these circuits and earth, could be neglected. It was also concerned with transformers with a greater capacitance between windings than to earth.

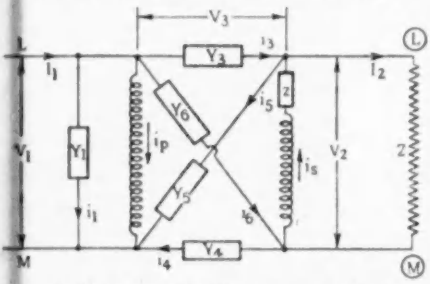


Fig. 1. Representation of current transformer to show various admittances

Method of Analysis

Owing to the complicated distribution of dielectric admittance it was necessary to adopt some system of lumped admittances as an approximation. For a start it was necessary to isolate the self-capacity of the windings and the capacitance between windings. The latter had a well-defined effect on the ratio which was largely independent of the relative potentials of the two circuits. The effect might be combined with the effect of the inductance of the primary winding and could be represented by a single complex-admittance Y connected across the primary terminals. Four lumped admittances, Y_3, Y_4, Y_5 and Y_6, served to represent approximately the capacitance between the windings. The leakage reactances and resistances of the windings could be combined into a single impedance located either in the primary or secondary and were in this case represented by Z. Thus the transformer could be represented as shown in Fig. 1.

The paper then continued by solving the network for ratios and described a test method using a bridge network to obtain practical values. It concluded by giving some hints, based on the analysis, on the construction of transformers with small dielectric admittances.

DISCUSSION

MR. A. HOBSON (Smith Hobson Ltd.) said it had been known for a long time that the capacitance effects referred to by the Author did exist; the only trouble was to know when they started and how to avoid them if possible. He was surprised that the Author did not mention the potential difference between the primary and secondary. The primary might be connected to a 10,000-V line and the secondary be at about earth potential, and then a comparatively large capacity current would flow from primary to secondary.

MR. J. G. WELLINGS (B.T.H.) thought the most important general observation to be made on the paper was that the Author had emphasised yet another admittance—the capacitance admittance which controlled the characteristics of the current transformer. He wondered what effect the paper would have on the high ratio, high-voltage current transformers made in U.S. and on the Continent.

MR. ARVON GLYNNE asked what purpose was served by the very high accuracy of current transformers and by making measurements to, say, 2 parts in 100,000, and pointed out that for ordinary practical purposes there was no instrument which could make use of that high accuracy. The ordinary integrating meter had an accuracy of perhaps 1 part in 1,000, and the ordinary ammeter of 1 part in 500.

MR. F. J. LANE pointed out that current transformers and voltage transformers were used for measuring high-speed conditions, for instance in the application of high-speed protection of various types. It had long been suspected that, particularly with voltage transformers, the capacity between the primary and secondary windings had an effect in delaying the reproduction of the secondary voltage in relation to the primary voltage.

MR. A. C. SIM, DR. L. HARTSHORN and DR. G. A. V. SOWTER also took part in the discussion, and the Author replied briefly.

Indoor and Outdoor LOW TENSION SWITCHGEAR

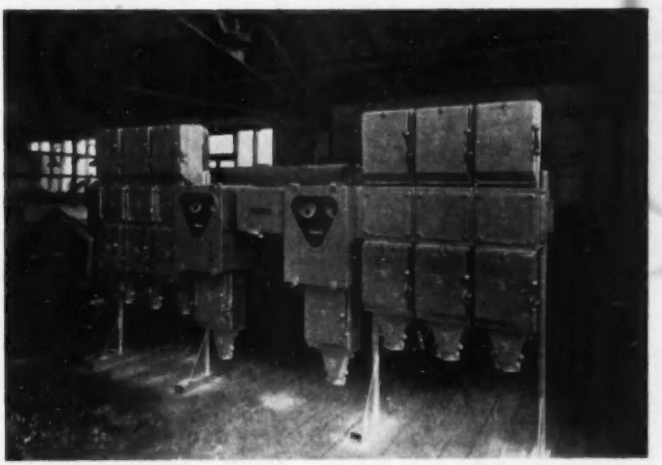
Unit System Applied to Tropical Conditions

DURING the war, the Yorkshire Switchgear and Engineering Co. was engaged in the production of important equipment for the Admiralty. Owing to the danger of production suffering due to the possibility of the main plant at Leeds being bombed, a certain amount of dispersal was achieved by the formation of an associated company—The Electro-Mechanical Manufacturing Co.—with their works at Scarborough. At the end of the war, this company undertook the manufacture of L.T. switchgear up to 660 V, 1,200 amp, and it was decided that in view of the experience already obtained in tropicalisation, a speciality would be made of both indoor and outdoor unit switchgear for use under these onerous conditions. An extensive and continuous demand thus arose, particularly from the oil industry, and equipment was shipped to the Dutch East Indies, South Africa, Venezuela, Columbia, Ecuador, Argentine, Holland, Iceland, Trinidad, Iran, Kuwait, Burma and other areas. The success of these installations has led to an extension of use of this unit type of switchgear to environments where conditions, although not necessarily tropical, are yet sufficiently arduous enough to require specially treated equipment. Such conditions are found in oil refineries, steelworks, chemical works, outside sites in dockyards, and on the railways, etc.

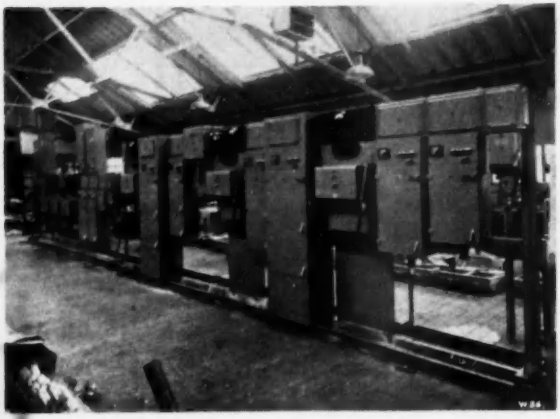
Types of Equipment Manufactured

The principal type of equipment manufactured at Scarborough consists of the range of "Y" and "YL" units, the former catering for the heavy power requirement, while the latter is more suited for lighting distribution and small power units. Components of the former comprise fuse-switches, switches, contactor starters, oil-circuit breakers, and bus-bar units which can be bolted together to form complete switchboards for wall and pedestal mounting. The bus-bar boxes have bolted front covers and machined faced ends to ensure the accurate bolting together of individual units to constitute a continuous bus system. Standard units take bars up to 1,000 amp for a three-phase, three or four-wire system. Special chambers can be supplied if it is found necessary to work up to higher amperages. The bus-bars themselves are connected by fishplate connectors, and openings are available on the top and bottom faces for feeder circuit connections which are clamped to the bars by electro-plated copper strips.

Fuse-switch or switch units are provided with hinged front covers secured by fixing bolts. The difference between these two types of unit is merely that the fuse in the former is replaced by a copper link in the latter. The units can be mounted directly above or below the bus-bar chamber, special adaptors being available if it is required to fit, say, a 300 amp switch on the top and a 60 amp switch at the bottom. In certain circumstances it is convenient to mount switches in tier formation, i.e. one immediately above the other. To facilitate this, the bus-bar



A fifteen circuit outdoor type "Y" switchboard with incoming metering panels for transformer station at Balik Papan, Borneo

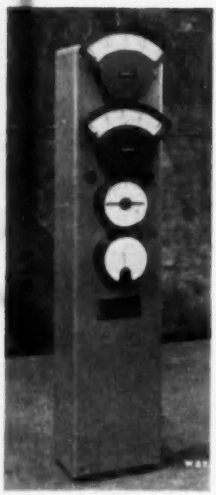


Two "Type Y" starter boards for a refinery, showing fully interlocked direction line motor starters up to 100 h.p., and incoming and bus section vertical isolation o.c.b. units of 800 amp capacity

connections can be directed through the first unit via a patented internal passage-way which is provided in all switch units.

Accommodation is provided in each box for a spare set of fuse cartridges. Other units, such as motor control panels, contactor starters and vertically isolated oil circuit breakers, utilise the same basic connecting system.

The standard range of fuse switches is 30 amp, 60 amp, 160 amp, 300 amp, 500 amp and 800 amp. An extension to 1,200 amp is available if needed.



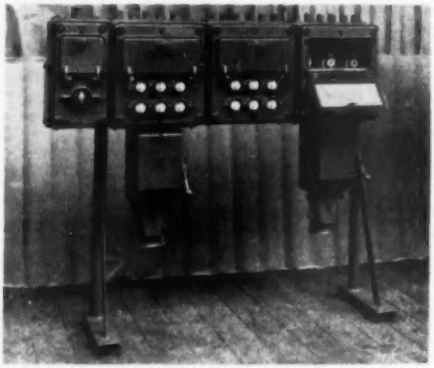
Standard synchronising pedestal which rotates through 180°

Tropical Finish

"Tropicalised" in the strictest sense of the term, the weather-proofing and construction of the outdoor units is such that an excellent performance is obtained under the most arduous conditions. Every component is carefully treated to withstand the abnormal tropical hazards of moisture, corrosion and fungus growths, particular attention being paid to the avoidance of contact potentials between different metals. The cases are of cast aluminium to give maximum durability; the insulation is varnished and dipped with anti-fungicide, and all copper is plated and dipped except where contact is to be made. Special grommets and insets serve to seal the boxes and render them completely weather and dustproof.

Special Units

Full advantage is continuously taken from the highly specialised tropical testing laboratory of Yorkshire Switchgear and Engineering Co., Ltd., to prove each component is entirely suitable in material and design, and decisions made as a result have been later confirmed by satisfactory service under operating conditions.



Lighting distribution board with 3-ph. power box mounted on left-hand side

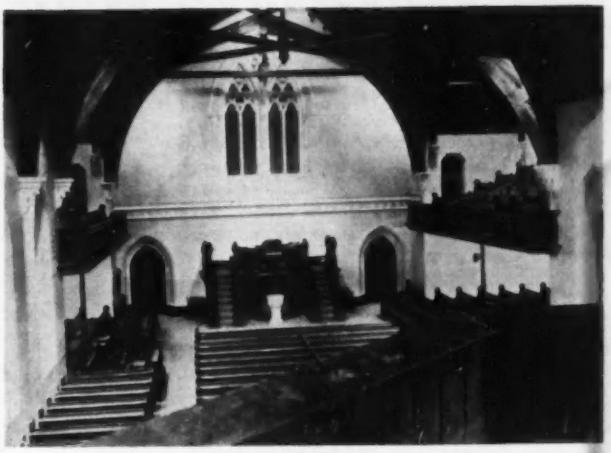
Beside the range of standard "Y" units, special units can be provided to perform other functions. Armour-glass fronted units can be used for meter installation, and chambers to contain protective and other special gear can be made to suit any particular type of installation. By using these items in conjunction with the standard unit range, complete switchgear installations of considerable complexity and size can be easily assembled, and as the need arises, easily extended and modified as required. This flexibility, combined with the robust construction, is the reason for the ever-increasing popularity of this type of equipment abroad and at home.

Lighting in South Africa

Requirements of the Eastern Cape Province

By W. GAUNT*

IN studying the lighting requirements of different parts of the world, the illuminating engineer must take into account conditions of climate and local circumstances which may vary widely from those in which he himself was trained. The observations in this article are based on the author's experience at the Port Elizabeth branch of The British General Electric Co., Ltd., which serves a large area of the Eastern Cape Province of South Africa, but it will be well to begin with a consideration of two factors which affect the approach to lighting in South Africa as a whole.



A pleasing installation of tungsten lighting in the Groot Kerk at Graff Reinet

Illumination Levels

In the first place, the brilliant sunlight to which the South African is accustomed for most of the year makes desirable higher levels of artificial illumination than are accepted, for example, in Great Britain. The increase may be put roughly at 25 per cent. When high-wattage tungsten lamps are used to provide these lighting standards their heat may be sufficient to cause discomfort in the South African climate. The result has been a wave of popularity for the cool-burning fluorescent lamp.

Secondly, wartime conditions necessitated British fluorescent lamp output being devoted to industry. This left the South African market open to American fluorescent lamp manufacturers, and to American ideas on lighting. American influence favours the high illumination levels already shown to be appropriate in South Africa, but in wartime, at least, it led to widespread use of unshielded lamps in the simplest types of channel fittings. Brightness was sought without reference to the principles of good lighting, and perhaps this was nowhere more in evidence than in the lighting of shop windows. A remarkable example of the way in which bare lamps were accepted for all types of installations was the use of 4 ft 40 watt lamps, unshielded, for lighting the Provincial Government Building in Cape Town.

In these circumstances it is not surprising that domestic lighting standards called for improvement, but it is not only the domestic user himself who needs education in lighting. He must often do the best he can with an electrical system installed without due regard for positioning fittings and lamps suitably to the size and shape of rooms. The co-operation of architects and contractors must be sought, to make them appreciate that lighting is an essential part of a house. By this means, and by education in the choice of fittings, proper light distribution and absence of glare will be achieved.

Much domestic architecture in the Eastern Cape Province is still influenced by the Flemish style, and for tungsten lighting in these surroundings good effects can be achieved in rooms with a single lighting point by the use of multi-lamp period fittings finished in appropriate

* The General Electric Company Ltd.

colours. Already, in houses and other premises of all styles, there are signs of a swing away from a previous over-addiction to chromium plating, towards fittings made of local materials.

General Survey

Port Elizabeth is an industrial centre, and the main source of supply for an area extending in each direction along the coast half way to Cape Town and Durban respectively, and stretching some 200 miles inland. It has its own large and modern electric lamp factory, operated by the E.L.M.A. group in South Africa (E.L.M.O.S.A.), where a high output of gas-filled lamps up to 200 watts is maintained. Other industries in and around Port Elizabeth include motor car assembly and motor tyre manufacture, confectionery, fruit canning, clothing, furniture, leather and battery production. The important towns inland are the railway centre of Uitenhage (known as the "Garden Town"), Graff Reinet, the centre of the Dutch Reformed Church, and Grahamstown, the centre of education in the Eastern Cape Province, with its many schools, colleges and universities. The old and beautiful Groot Kerk of the Dutch Reformed Church at Graff Reinet has been equipped recently with a new lighting installation of Osram tungsten lamps in Gecoray reflectors which has been the subject of much favourable comment.

A grid system for electricity supply is being developed as fast as circumstances allow, but many of the smaller centres have their own local power stations, 100-110 volt a.c., and in some cases, d.c. mains supply. Much of the power distribution is overhead. In the larger towns the voltage is fairly standard at 230 volt. Extensive use is made of wind-driven generators by the large farming community, conditions in the Province being particularly favourable because of the winds that blow inland both from the Atlantic and Indian Oceans. Port Elizabeth itself claims to be one of the windiest places in the world.

The South African Railways are large users of industrial type fittings and tungsten lamps, one of their important centres so equipped being the rolling stock works at Uitenhage. At Port Elizabeth the only works in South Africa building double-deck bus bodies has a complete installation of tungsten lighting with standard R.L.M. dispersive reflectors. A notable fluorescent installation is at the Uitenhage factory of Fine Wool Products (South Africa) Ltd. Trouble was experienced here from corrosion of fittings due to the high operating humidity, but this has now been successfully overcome by the use of "Perspex" fittings.

Proposed Standards

There is growing recognition of the need for improvement in industrial lighting, and steps have been taken to form a Bureau of Standards that will lay down minimum requirements for industrial illumination. Much can be done in this direction by co-operation with local factory inspectors, who are showing a keen interest in the subject and welcome the advice of lighting technicians.

Street Lighting

Street lighting on the coast of the Cape Province encounters a problem of its own in the shape of marine atmospheres particularly conducive to corrosion, and their effects are aggravated by the high winds already noted. In fact, the coast from Durban to Port Elizabeth is often called the "Rust Belt," and is said to be the second worst area in the world in this respect. The combination of corrosion and vibration are sufficient to make some types of lantern both optically and mechanically unsound after a short period of service. Suitable materials and finishes can combat these effects. It is usually possible to employ special materials in the manufacture of street lighting lanterns for difficult situations, whereas mass-produced industrial lighting fittings have to rely on the protection of various kinds of paints and finishes and it may be quoted in this connection that some lanterns erected at Port Elizabeth in 1936 were found to be still in excellent condition 10 years later.

Various types of lanterns have been tested for dock lighting at Port Elizabeth and East London, and the lantern proving itself most suitable for use at the docks has been a reflector type with a copper housing.

Hospital lighting authorities are no less interested than industry and business in new lighting methods and appliances.

Taking a general view of lighting in the Cape Province at the present time, it may be said in conclusion that over-emphasis on high-illumination with fluorescent lamps, paying little regard to appropriate fittings and arrangement, is likely to cause a mild reaction towards tungsten lighting in decorative fittings. There is much scope for proper guidance in this direction but it may well be that the most important task for the lighting engineer will be the education of users in the merits of fluorescent lighting when properly applied.

Visual Aids to Landing

Different Lighting Systems described at I.E.S. Meeting

A PAPER, read on Tuesday at the meeting of the Illuminating Engineering Society, dealt with the development of high intensity aids: that is, the aids which in bad visibility enable the pilot to bridge the gap between the runway and the point on the approach path where he can no longer follow the electronic approach aids. For the two electronic aids in general use at present, i.e. the instrument landing system with manual coupling, and ground controlled approach, this is from about 200 ft downwards. This last 200 ft is the most critical part of any bad weather landing for the reason that it involves a quick transition from instrument to visual flight in conditions in which the horizon and other indications which the pilot instinctively uses to make his judgment are blotted out.

Mr. E. S. Calvert, Author of the paper, pointed out that to people accustomed to driving a surface vehicle it might seem that some simple pattern such as a line of small-sized lights along the left-side of the approach area would give the pilot all the guidance he needed. This and similar patterns had been tested in many different countries, and it had invariably been found that they did not provide the necessary guidance in visibilities worse than half a mile. In fact, some of them were as much a hazard as an aid in that they were liable to produce illusions and misjudgment at the moment of transition. The main reason for this was that aircraft had six degrees of freedom, as against three for a surface vehicle.

Reason for Illusions

The paper discussed these illusions, and showed that they were due to two deficiencies in the patterns used, i.e. absence of texture, and absence of a horizon indication. The first could be eliminated by using fittings of appreciable size, thereby giving an appearance of reality to the pattern, usually known as "depth."

The second deficiency could be eliminated by using bars of lights running transversely across the approach area. This was the basis of the crossbar system, which consisted of a line of lights along the middle of the approach area, with bars of lights running transversely across it at intervals. Eleven installations of this system were put down on the Air Lift, and another had been in use at London Airport since November, 1948. Landings with passengers had been made on the London installation in daytime in meteorological visibilities down to 250 yds, and pilots had reported that they are able to use the system with confidence and safety even at the first attempt.

Standardisation

International standardisation was necessary if visual aids were to be used with maximum efficiency, but this was difficult to achieve because it involved questions both of economics and prestige. In this case the difficulties were increased because there was no generally accepted theory as to how visual judgments are made. An attempt had therefore been made to build up a coherent theory of visual judgment, and to use this to evaluate the guidance which was provided by three systems which had received most support, i.e. the crossbar system, the slopeline system and the single line method.

This theory, which was known as the "parafoveal streamer" theory was briefly as follows. When the aircraft was several miles from the runway, the angular subtense of the pattern and the rate of change of the perspective image were both small and the pilot made his judgment by scanning the pattern and comparing the perspective image with an ideal one which he carried in his memory. As the aircraft came closer to the pattern its apparent size became so large that the pilot could no longer scan it comfortably. At the same time the rate of change of the perspective image rapidly increased. At about 150 ft, the pilot began to stare straight ahead with his head and eyeballs fixed. After this he derived his impressions of height and direction of motion mainly from the pattern formed by the paths which the retinal images of the lights traced out on the parafovea, and from the velocity of the images along these paths. These paths might be called "streamers", the pattern a "streamer" pattern, and the image velocity the "streamer velocity." It was shown that the streamer pattern provided an indication of aiming point, and that the streamer velocity provided an indication of proximity to ground. The reason why the pilot did not move his eyeballs was that it was easier to judge streamer patterns and velocities if he kept his eyes fixed.

overseas news

Air Conditioning in Singapore

Using British and local materials, a Singapore engineering concern plans to manufacture tropical room air-conditioners by June, it is reported. Last year, Malaya spent nearly a million Straits dollars on air-conditioning equipment and spare parts imported from the U.S.A.

Rural Electrification in W.A.

Details of the plan for rural electrification under the South West Power Scheme of the State Electricity Commission of Western Australia were given recently. The first step of the plan provides for the purchase of the existing Collie Power Co.'s power station and conversion of two existing 2,500 kW sets from 40 to 50 c/s, and adding three more 2,500 kW 50 c/s turbo-alternators. A further provision in stage one of the plan is the extension of supplies to a number of small towns. Under the second stage of the plan, it is intended to install an additional boiler at the Collie power station and to link up further towns and areas. Stage one is now being implemented, the extensions at the Collie power station being well advanced. The construction of a 66,000-V line from Collie to Picton is also nearing completion.

Plant for Yallourn

The State Electricity Commission of Victoria has placed an order with C. A. Parsons and Co., for two 50 MW turbo-alternators for installation in the Yallourn "D" power station, the chairman of the Commission announced earlier this month.

Protests at Sydney

The general manager of the electricity undertaking of the Sydney County Council, N.S.W., Mr. G. S. Boyd, has been criticised and defended for issuing a pamphlet protesting against the proposal to set up a State Electricity Commission. The pamphlet, which has been sent to the council's consumers, states that the proposed Commission is unnecessary and undesirable, and replies to a charge of inefficiency made against the council. One member of the County Council thought Mr. Boyd had exceeded his authority by ordering about 450,000 pamphlets. It was pointed out, however, that back in January the council resolved to resist the setting up of a commission "with all the power at its disposal." This resolution gave Mr. Boyd authority for printing and distributing the pamphlets.

Increases at Victoria

Increases in charges to all consumers have been announced by the State Electricity Commission of Victoria. The increases vary between 5% and 9%, and will operate from July 1. This increase will be the third made by the Commission in two years; previous rises were 12% on July 1, 1948, and about 9% in October last.

Novel Electric Locos

An interesting departure from conventional electric traction practice has been announced in Vancouver by, Mr. A. C. Monteith, vice-president in charge of engineering of the Westinghouse Electric Corporation. He states that the company is building two electric locomotives which will be equipped with electronic tubes, or ignitrons, enabling them to combine the advantages of alternating current power supply with direct current driving motors. He believes that this departure may open the way to widespread railroad electrification.

British Scholarships for Canadians?

A scholarship scheme which, in time, may lead to increased goodwill and trade between Canada and Great Britain, was explained in Toronto by Sir Arthur Fleming, director of research and education, Metropolitan-Vickers Electrical Co., Ltd. Sir Arthur is on a fact-finding Dominion-wide tour to interest Canadian universities in engineering scholarships in England. The scholarships may be one or two years in duration, and in some cases may be taken during the summer vacation period. Postgraduate study could be undertaken at Cambridge, Birmingham or London. He said it was hoped the scheme would commence operating next year.

Beauharnois Arbitration

After 4½ years of intermittent sittings, the hearing of evidence before the Tremblay arbitration board appointed to fix the expropriation price for the assets of the Beauharnois Light, Heat and Power Co., was concluded last month. The case has not yet finished, however, for written evidence is now to be submitted. The Beauharnois Co. was expropriated by the Quebec Hydro Commission in April, 1944. The arbitration board, was appointed in December, 1945, and after many informal meetings, held its first formal session in September, 1946. The Commission made an initial offer of about $72,260,000, but claimed the debts and charges totalled approximately $79,380,000, so shareholders would get nothing. Rejecting this offer, the shareholders asked for $45,000,000 and amended their claim last year by adding about $11,000,000. The history of the Beauharnois plant has been marked by delays and inquiries extending over many years. The first company was formed in 1902 to develop power in the Soulanges section of the St. Lawrence River.

But it was not until the end of the 1920's that construction began after a series of financial reorganisations that were explored in a Parliamentary inquiry in 1931. When the Commission took over the Beauharnois plant, its capacity was 650,000 h.p., made up of five generating sets. Another unit has been put into operation since, and a further power house is under construction to accommodate 12 more sets, the last of which it is expected will be in operation in 1960.

Williams Lake Project

An urgent appeal to proceed with development of the Quesnel River hydro-electric power project has been made to the British Columbia provincial government by the Williams Lake Board of Trade. It was pointed out that 40,000 people of the central interior, including the areas of Williams Lake, Wells, Quesnel and Prince George, are expecting the completion of this promised project by the Commission. Further extensions of production and development for the Cariboo and Prince George districts are dependent on it. The resolution pointed out that the central interior is one of the greatest areas of undeveloped natural resources on the North American continent. Survey of power sites on the Quesnel River were completed last year and the reports submitted to the government. Opposition to the project is expected from the International Pacific Salmon Fishing Commission but locally it is considered that the power project is of far greater economic value than the entire Quesnel River run of salmon.

Tidal Power Scheme

It was disclosed last month that engineers of the Ministry of Resources of Canada have been instructed to conduct an investigation with a view to instigating an on-site survey of the Bay of Fundy tidal power scheme. Proposals for the St. Mary's tidal power project at the head of the Bay of Fundy were originally made many years ago, but were later quashed. More recently an engineer has suggested that more than 2,140,000 h.p. could be obtained by building the "barriers" some ten miles downstream from the original site.

India's Fan Trade

The 28-year-old electric fan industry in India is now in a position to meet the entire needs of the country, and will soon be able to export fans to neighbouring countries, it is claimed. At present there are about 30 local factories making electric fans on an organised basis, their total capacity being over 300,000 a year. The country's present annual demand for ceiling and table fans is placed at 140,000 and 60,000 respectively. The industry, however, has not yet been able to manufacture a satisfactory oscillating mechanism it is stated.

Bombay Schemes

Dr. Jivaraj Mehta, Minister for Public Works, Bombay, has announced the decision of the Government to "pursue vigorously the Koyna and Tapti River hydro-electric schemes of the State." Dr. Mehta, who was presiding over the Silver Jubilee celebrations of the Electrical Contractors' Association, said that schemes of this magnitude would take their own time for completion and might not be of much use in the immediate future. The Government had, therefore, decided to install an additional plant having a capacity of 45,000 kW to operate in conjunction with the existing thermal station at Chola. Meanwhile every effort is to be made to obtain the necessary machinery from U.K. or U.S.A. to complete the Koyna and Tapti River schemes as expeditiously as possible. The combined irrigation and hydro-electric scheme across the Tapti River at Kakrapar in Surat District, when completed, will be capable of developing 216,000 kW.

Load Shedding

Anticipating possible load shedding during the coming winter, the City of Salisbury Electricity Department, Southern Rhodesia, has evolved a plan, dividing the area into zones which will have their power cut off on different days of the week. This precaution has been taken, although it is not expected that power cuts will be severe, the critical period is between 6 and 7 p.m.

Another Link-up

A South-Eastern Power Administration, to link Federal power-producing units from Kentucky to Florida, has been created by the U.S. Secretary of the Interior. In this region, two dams are already in operation, seven are under construction and 13 more have already been authorised and are in the planning stage. The South-Eastern Power Administration expects to handle over one million kilowatts of federally-generated power by the end of 1955.

Large T.V. Tubes

A new 30-in. television tube is now being developed by an American concern, and is expected to be on the market by the autumn, we understand. Providing a 600 sq in. picture, it is intended for use in public places such as schools, restaurants and hotels. The company is also planning to build still larger direct-view tubes, including one measuring 4 ft by 5 ft.

New Guinea Project

The Federal Government has granted a loan of £192,000 for the establishment of a hydro-electric project at Port Moresby, capital of Papua and New Guinea. It is expected that the scheme will take three or four years to complete.

Volcanic Power?

A Japanese power company plans to start work on a scheme to develop electric power from volcanic heat next month, it is reported. The firm has mobilised its entire technical staff for the job, which will cost about £125,000 sterling. The volcano is at Nogami village, in Oita prefecture, Kyushu.

PERSONALITIES

IN THE INDUSTRY

We hear from **Mr. H. Lythgoe Reddyhough,** A.M.I.E.E., M.Inst.F., that he retired last month from the position of chief engineer to the Gourepore Electric Supply Co., Ltd., West Bengal, and is now on his way to England. During his 12½ years in that post he was responsible for considerable development of the undertaking. He planned the complete modernisation of the power station with h.p. boilers, two 18,750 kW turbo-alternators, coal handling plant, etc., the first step of this project being virtually completed at the time of his retirement. Prior to going out to India, he was well known in the supply industry in this country, as station superintendent at Back o'th' Bank power station, Bolton. He is also a past chairman of the Manchester section of the E.P.E.A. and a past member of the National Executive Council. Before leaving Bengal, Mr. Reddyhough was presented with a gold cigarette case from the staff and employees of the undertaking, and a silver salver from the European communities of Gourepore, Nuddea and Bansberia. Mr. and Mrs. Reddyhough are making an extended trip home via Ceylon, East and South Africa, and expect to take up residence around London towards the end of June.

Mr. H. L. Reddyhough

Retiring after 51 years' service with the Nottingham electricity undertaking, **Mr. W. Moore,** M.I.E.E., sub-area engineer, No. 6 sub-area of the East Midlands Electricity Board, was presented last week with a television set by **Mr. M. Wadeson,** M.I.E.E., sub-area manager, on behalf of his colleagues. Starting with the Nottingham undertaking in 1899, Mr. Moore became mains engineer in 1913, distribution superintendent in 1946, and sub-area engineer in 1948. He is succeeded by his former deputy, **Mr. W. F. Perkins,** who also has served continuously at Nottingham since 1912 (apart from war service). He rose to consumers' engineer in 1928, deputy distribution engineer in 1946, and deputy sub-area engineer in 1948.

The South West Scotland Electricity Board has appointed **Mr. A. A. Wallace,** A.A.C.C.A., as chief accountant in succession to Mr. C. W. Flint, who is taking up a similar appointment with the East Midlands Electricity Board. Mr. Wallace, was one of Mr. Flint's principal assistants and before vesting date was accountant to the Glasgow Corporation Electricity Department. He takes up duties as chief accountant early next month.

We learn that **Mr. R. W. Griffin** B.Sc.(Eng.), A.M.I.E.E., M.Inst.F., M.Inst.R., and **Mr. Cecil H. Smith,** B.Sc.(Eng.), A.C.G.I., M.Inst.F., have set up in practice as consulting engineers under the title of Griffin, Smith and Partners Ltd., of 28 St. James's Place, S.W.1, and are specialising in instrumentation, industrial process control, steam raising and electrical equipment. Both Mr. Griffin and Mr. Smith were latterly with Dunford and Elliott (Sheffield) Ltd., Mr. Griffin having previously spent many years with Elliott Brothers (London) Ltd., while Mr. Smith served with Wellman Smith Owen Engineering Corpn., for whom he established a research department.

Commander C. F. Nock, D.S.O., R.N.(retd.), has joined the board of Tuscan Engineering Co., Ltd.

Ekco-Ensign Electric Ltd. announce that **Mr. A. H. Robertson** has been appointed to represent them in Area 61, covering Argyle, Stirling, Dumbarton, Renfrew, Ayr, Lanark, Wigtown, Kircudbright, Dumfries and Clackmannan.

Promoted engineer for planning with the State Electricity Commission of Victoria two months ago, **Mr. R. A. K. Palmer,** M.Mech.E., B.E.E., Dip. com., A.M.I.E.(Aust.), has been nominated to replace the Commission's chairman, Mr. R. A. Hunt, on the Latrobe Valley Development Advisory Committee. Mr. Hunt has resigned owing to pressure of his other work. Born in London, Mr. Palmer joined the commission in 1929 as an engineer.

In succession to Mr. H. W. Baker who was recently appointed assistant superintendent engineer, television, **Mr. H. Walker,** O.B.E., A.M.I.E.E., is now nominated engineer-in-charge of the London Television Station at Alexandra Palace. Mr. Walker has been with the B.B.C. since 1931, joining the staff of the London Television Station just before it opened in 1936. After war service he returned as assistant engineer-in-charge when the service was restarted in 1946.

Dr. A. R. A. Rendall, Ph.D., M.I.E.E., has been appointed head of the Designs Department of the B.B.C., following **Mr. H. B. Rantzen's** resignation. Dr. Rendall joined the Lines Department of the B.B.C. in 1935 from the International Standard Electric Corporation, where his work on non-linear distortion on loaded cable circuits earned him the degree of Ph.D. In 1941 he was appointed assistant head of the Lines Department, and in 1947 he became assistant head of the Designs Department.

Formerly district executive officer for the Frome district, Southern Electricity Board, **Mr. W. P. C. Orchard** has taken up a new post as district commercial officer for the Salisbury district of the Board.

One of the founders of the Clarkson Thimble Tube Boiler Co., Ltd., **Mr. H. J. Fountain,** retired from the position of managing director at the end of last month, but remains on the board of directors as consultant. He is succeeded as managing director by **Mr. S. W. Spurr,** who joined the company as general manager three years ago and was elected to the Board in 1949. Earlier, he had served with Babcock and Wilcox Ltd., for over 20 years. Mr. Spurr, by the way, is the son of **Mr. G. R. Spurr,** who for about 35 years was borough electrical engineer and manager at Walthamstow.

On his retirement after more than forty years' service at Greenock, **Mr. W. A. Woodrow,** A.M.I.E.E., district manager in that town for the South West Scotland Electricity Board, was recently presented with a gold wristlet watch by Mr. D. Ross on behalf of his colleagues. Prior to Vesting day Mr. Woodrow was burgh electrical engineer at Greenock.

Mr. John V. G. Hope has been appointed secretary of Parmiter, Hope and Sugden Ltd., in succession to **Mr. W. N. Sugden** who, for reasons of health, retired at the end of last month.

Previously with E. Kirke and Co., **Mr. J. G. W. Harvey** has been appointed manager of the branch of B. and S. Supplies Ltd., at 22 Camden Street, Sherwell, Plymouth, and will be responsible for sales in Devon and Cornwall.

Maj.-Gen. W. S. Tope, M.I.Mech.E., M.I.E.E., has been elected chairman of the board of Henry Meadows, Ltd.

In succession to Mr. L. Hotine, **Mr. E. G. Chadder** has been appointed senior superintendent engineer, sound, to the B.B.C. He joined the British Broadcasting Co., as it then was, in 1923, and has since held several senior posts in the Engineering Division. He was successively engineer-in-charge at Aberdeen and Washford, and became assistant superintendent engineer, transmitters, in 1935, assistant superintendent engineer, studios, in 1937, and superintendent engineer, studios, in 1939. In turn, Mr. Chadder is succeeded by **Mr. F. Williams,** B.Sc., M.I.E.E., as superintendent engineer, studios. He has served with the B.B.C. since 1925, being successively engineer-in-charge of the studio centres at Cardiff, Birmingham and Manchester. He was appointed assistant superintendent engineer, studios, in 1940, and since last year has been head of the Engineering Secretariat.

Mr. E. G. Chadder

Mr. F. Williams

A presentation was made a few days ago to **Mr. W. I. Robbins,** district commercial officer at Cirencester to the Southern Electricity Board, who is to take up an appointment as consumers' engineer with the Midlands Electricity Board at Worcester.

Until recently electrical designer with Airspeed Ltd., **Mr. F. Brookesmith** has now joined Harley Landing Lamps Co.

Mr. A. Winstanley, of Winstanley and Barnett, has been elected chairman of the Merseyside branch of the Electrical Contractors Association. The new deputy chairman is **Mr. R. J. Chatham,** of the firm of that name.

The engagement has been announced of **Mr. Hugh Self,** younger son of Sir Henry Self, Deputy Chairman (Administration) of the British Electricity Authority, to **Miss Penelope Ann Drinkwater,** daughter of the late John Drinkwater, poet and playwright.

Recently appointed assistant station superintendent at Meaford power station, Midlands Division, is **Mr. B. Sidebottom,** A.M.C.T., A.M.I.Mech.E. For a similar position at Stourport station, in the same division, **Mr. C. J. Chesney,** A.M.I.E.E., has been selected.

Substation attendant, Edinburgh area, South East Scotland Electricity Board, **Mr. J. W. Mucklow** recently received a presentation on his retirement after fifty years' service in the industry.

Mr. J. Innes, C.B., formerly managing director of Cable and Wireless, Ltd., has been appointed to the board of the Telegraph Construction and Maintenance Co., Ltd.

In succession to **Mr. Howard Coonley** of the U.S.A., **M. Caquot** of France, has been elected president of the Organisation for Standardisation (150), the body which makes recommendations for adoption internationally. Mr. Caquot is a distinguished civil engineer.

Sir Harold Moore has retired from the Board of Kalgoorlie Electric Power and Lighting Co., and **Mr. D. E. Webb** has been elected a director.

The Steel Company of Wales Ltd., has appointed **Mr. J. H. Groocock,** B.Sc., as chief electrical engineer for their Abbey, Margam and Port Talbot Works. On obtaining his degree, Mr. Groocock spent two years with Sulzer Bros., Ltd., at their head office and works at Winterthur, Switzerland. In 1934 he returned to this country to take up a post with Imperial Chemical Industries Ltd., at Birmingham, and in 1939 was transferred to Swansea, becoming Regional Electrical Engineer for the South Wales Factories of the Metal Division. He remained in this position until taking up his new appointment.

The Minister of Fuel and Power has appointed **Alderman R. Barker,** J.P., as a part-time member of the Yorkshire Electricity Board in place of the late Mr. A. W. Brown.

Yesterday **Mr. H. G. McHaffie** sailed, in the *Empress of Canada*, to represent the B.T.H. Export Co. (his appointment we noted in our March 9 issue). He will be centred in Toronto.

Later this month, **Mr. D. P. Sayers**, B.SC., M.I.E.E., M.I.MECH.E., deputy chief engineer, transmission, to the B.E.A., is going to Cologne to attend the conference on Power Production to be held at the University of Cologne on April 29 and 30. He is to present a paper on "Developments in the British Electricity Grid System."

OBITUARY

We regret to record the death, on April 3, of **Mr. F. Hope-Jones**, M.I.E.E., F.R.A.S., aged 83, a founder of the Synchronome Co., Ltd., who has been prominently associated with the development of electric clocks. He registered his first patent for an electric clock in 1895 and has since added numerous patents covering such mechanisms. He was a Fellow, Past Chairman, vice-President and Gold Medallist of the British Horological Institute. He was also the author of a number of books on electric clocks.

We regret to hear of the death, on April 3, of **Capt. W. Scott**, managing director of the Normand Electrical Co., Ltd.

We regret to note the death on April 4, of **Mr. R. H. Symonds**, aged 81, founder and chairman of R. H. Symonds, Ltd., and Symonds Bros., Ltd.

The death occurred on April 7, of **Mr. G. H. Nash**, O.B.E., M.I.E.E., M.R.I., F.A.I.E.E., who was a director of Standard Telephones and Cables, Ltd. from 1927 to 1938; chairman of the International Marine Radio Corpn. from 1930 to 1934, and technical consultant to the International Standard Electric Corpn. from 1933 to 1938.

We note the death on April 7, of **Sir James Henderson**, D.SC., LL.D., M.I.E.E., F.INST.P., who was Professor of Applied Mechanics at the Royal Naval College, Greenwich, from 1905 to 1920. Previously he was lecturer in electrical engineering and university assistant in engineering, at Glasgow University.

NEW LITERATURE

Consulting Engineers' Year Book, 1950

IN response to demands, the main part of this edition has been made up in three parts—consulting engineers, home and overseas, and those who are members of the A.C.E. There is a further section devoted to firms only. A list of voltages in the U.K. also is included, but we feel that this information could have been presented in a much more up-to-date manner. A further addition is a list of trade marks which some may find of use. Published by Princes Press Ltd. Price £1. 248 pages, 8½ in. by 6 in.

Maintenance Manual of Electronic Control

edited by R. E. Millar

THE growing use of electronic control for many industrial processes has inevitably brought maintenance problems in its train which are difficult of solution by the factory engineering staff. It is for such staff that this book has primarily been written; it is essentially a practical handbook for the working technician. The field covered is comprehensive, and includes practically every type of electronic control used commercially. A simple approach to the general basic principles of valves and typical circuits is given, so that any person with a grounding in electrical matters can readily pick up the subject. "Trouble-shooting" and the installation and maintenance of specific types of equipment are also included.

With the aid of this excellent volume, there should be little reason why the installation of electronic control and operating gear should give qualms to the existing electrical maintenance personnel. Published by the McGraw-Hill Publishing Company, 304 pages, 5½ in. by 9 in. Price 38s. 6d.

Electricity in the Service of Man

by S. G. Starling

ONE of the great difficulties in revising a book originally written a considerable time ago, is to know what to strike out and what to add to bring it into line with modern practice. This is particularly so in the case of electricity where development and progress has been extremely rapid and where everyday applications have multiplied enormously within the past two decades.

This volume was originally written in 1922 for general consumption and although considerable amendment and addition has been made since that date, it still contains much matter which is only of academic interest, as well as descriptions and illustrations of apparatus which has been long superseded by more modern equipment, and which is now only to be found in the cupboards of school and university physics laboratories.

Although this treatment, together with the extremely simple non-mathematical attack on the subject, restricts the book's appeal to the electrical engineer, it is still of considerable use to those who wish to obtain a good knowledge of the fundamental and historical experiments on which the theory and practice of electrical technology are founded. Published by Longmans, Green and Co., Ltd., 8½ in. by 5½ in. Price 12s. 6d.

BOOKS RECEIVED

The Mathematics of Circuit Analysis, by E. A. Guillemen. Supplements usual undergraduate course in mathematics. Published by Chapman and Hall, 590 pages, 9 in. by 6 in. Price £3.

Electric and Magnetic Fields, by S. S. Attwood. Degree standard. Published by Chapman and Hall, 475 pages, 3rd edition. Price £2 2s.

The BUYER'S *Column*

A Reliable Heavy-duty Drill

DESIGNED for arduous heavy duty conditions, the new Model 2A drill just introduced by WESTOOL LTD., St. Helens, Auckland, Co. Durham, is particularly useful for steel construction work and engine repair work.

Ball bearings are fitted throughout and mounted in bronze housings which are cast integrally with

Westool's new Model 2A drill

the high tensile aluminium alloy. The drill socket incorporates a heavy duty roller bearing.

The four-pole a.c./d.c. motor may be wound for all standard voltages, 110, 220 or 250, at frequencies of 25 or 60 cycles. Special windings for other voltages can be supplied at an extra charge. Control of the motor is by a quick break double pole 25-amp switch.

The drill can be supplied as required with either a high or low speed gearing.

A feature to be noted in this new drill is the automatic ejection from the socket of the drill bit which results simply from screwing down the feed handle, thus avoiding the necessity of drifts. The drill socket is of hardened nickel chrome steel, offset to facilitate close cover drilling. It is housed within the gear case to reduce the overhang and increase rigidity. A No. 3 Morse taper is used.

Capacity of this drill is pleasing— $\frac{3}{8}$ in.-$1\frac{1}{4}$ in. by 5 in. deep in mild steel. Load speed is 180 r.p.m. approximate (230 r.p.m. no load) in normal drilling. Net weight is 43 lb and overall length 18 in.

Price Reductions

TWO price reductions have been recently announced. SUNVIC CONTROLS LTD., 10 Essex Street, Strand, W.C.2, announced that since the beginning of last month, 1950 list prices of type TQ4 water heater thermostats are as follows: 11 in. TQA model, 27s. 6d.; 18 in. TQA model, 29s. Pockets for both sizes are now priced 2s. 6d. THE GENERAL ELECTRIC CO. LTD. announce that due to increased production and demand the list price of the G.E.C. No. 22 shredded foil photoflash bulb has been reduced from 2s. to 1s. 10d.

High Quality Heaters

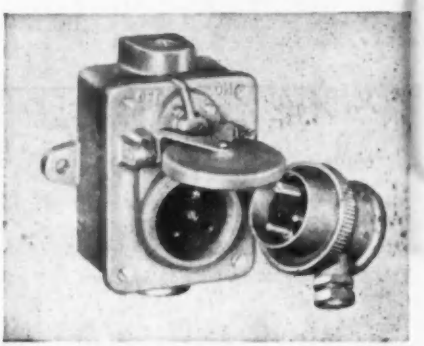
FROM C. H. BLACKBURN AND CO. LTD., 10 Grays Inn Road, London W.C.1, we have received details of their latest range of immersion heaters.

These are made to the latest B.S. specification and voltages range from 200 to 250 V with loadings of 1, 2 and 3 kW. Other voltages and loadings can be supplied as required. The length of the element, which is of the rod type, varies from 12 in. to 30 in. and is of a particularly robust design; in fact on destruction tests it is reported that they have burnt for 24 hours in "free air," at medium red heat before breakdown.

Automatically controlled heaters range in price from £4 10s. for the 1 kW type with 12 in. element to £7 18s. 6d. for the 4 kW type with 30 in. element, whilst non-automatic types are priced from £3 15s. to £6 8s. 6d.

Industrial Switch-Sockets and Plugs

A NEW design of weatherproof switch-socket has been introduced by THE GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, W.C.2, for arduous factory service, and is also approved by Lloyds as complying with their



The weatherproof switch socket just introduced by the General Electric Co. Ltd.

requirements for tankers (Section 15, Clause 9 (d)). The switch-sockets are made in 5-amp and 15-amp sizes, and are supplied with 3-pin plugs with

double-pole or single-pole fusing, or are unfused. Substantial clamping rings prevent accidental withdrawal of the plugs. An interlocking mechanism ensures that the switch cannot be operated until the plug is fully inserted, and also that the plug cannot be withdrawn if the switch is in the "on" position.

To provide for installations where there are alternative voltages, the plugs are provided with one, two, or three dowel pins, which engage with corresponding apertures in the socket discs. Any plug, therefore, can be inserted only into the sockets on the circuit at the appropriate voltage for the apparatus to which it is connected.

The switches are G.E.C. "Landor" (5-amp) or "Landor Senior" (15-amp) rapid make rapid break types for a.c. or d.c. The switch-socket boxes and lids are of cast-iron, with stoved aluminium finish as standard, or can be supplied sheradised at extra cost. A brass cover, finished dull nickel plate, protects the socket when the plug is withdrawn. This cover is supplied spring-loaded as standard, but a screw-on pattern can be supplied if required. The brass casing of the plugs is in a dull nickel plate finish.

Nickel Alloys in the Radio Industry

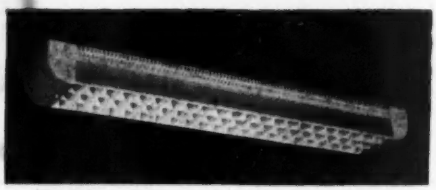
SPEED in supply is something in which BRITISH DRIVER HARRIS CO. LTD., of Gaythorn Mill, Albion Street, Manchester 15, take great pride.

The quality of their nickel alloys is also something of which they can be justifiably proud.

Examples of their range of products which will find a wide market in the radio and lamp industries are cathode nickel, 99/100% pure nickel, nickel manganese, nickel chromium iron 42/5 (No. 4 Alloy), chromium iron 26/28, 50/50 nickel iron, nickel iron manganese and nickel cobalt iron.

Elegant but Kind to the Eyes

CONSIDERABLE care in design is evident in the Type F.12 fluorescent fitting just introduced by COURTNEY POPE (ELECTRICAL) LTD., of Amhurst Park Works, Tottenham, London N.15.



This is the elegant F.12 fitting by Courtney Pope

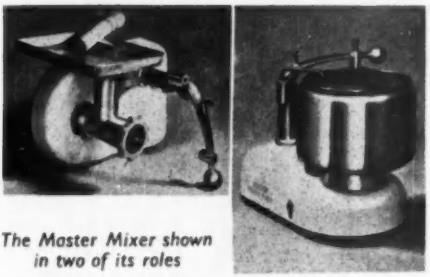
In keeping with the trend in design today towards efficient yet glare-free lighting, this new fitting is provided with a louvre panel which has shielding angles of 30° longitudinally and laterally. Prismatic glass panels in the side of the fitting refract the light downwards at an angle of 45°, thus affording even distribution of light over a wide area.

The fitting has an appearance elegant in its simplicity and will prove very suitable for lighting large interior areas such as offices, canteens, etc. Apertures at the top of each side provide ventilation for the control gear and ensure the absence of shadowed ceiling areas.

Danish Design

BASED on Danish designs, a kitchen machine of a new pattern suitable for the larger domestic or small commercial kitchens, has been introduced by BALLERUP LTD., of 77 Great Peter Street, London S.W.1.

The "Master Mixer" is basically a food mixing machine. It operates with a rotating stainless steel



The Master Mixer shown in two of its roles

bowl in which the mixture is beaten by the action of an adjustable spring-loaded arm with rotating "dolly" in conjunction with a scraper.

Standard equipment supplied with the machine includes a mincer with tray and feed rod, sausage case filler, cake discs and a fruit press. This last item will no doubt influence its adoption in nursing homes and hospitals.

Additional attachments, available shortly, will include a coffee grinder, meat and vegetable slicers and shredders, and a device for whipping fine mixtures.

Supplied with standard equipment in voltage ranges 100-250 a.c. or d.c., the "Master Mixer" is priced £44 plus purchase tax.

TRADE PUBLICATIONS

TELEPHONE EQUIPMENT. Various items of equipment produced by the Telephone Manufacturing Co. Ltd., Martell Road, West Dulwich, S.E.21, are described and discussed from a technical viewpoint in the "T.M.C. Technical Journal," a new periodical, published by the Company at a price of 5s. issue.

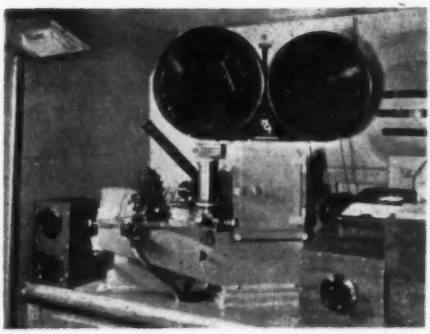
AUTOMATIC TIME LAG SWITCHES. The complete range of "Columbus" time lag switches is described in a leaflet issued by Elkay Electrical Manufacturing Co., Ltd., 4 Southampton Row, London W.C.1, who are sole concessionaires for these switches.

CAM OPERATED CONTACTOR CONTROLLERS are described in List No. 48 recently issued by De Renzi Holmes and Co., Ltd., Fox's Lane, Wolverhampton.

Records by the Hour

A Mobile Recording Laboratory Hire Service

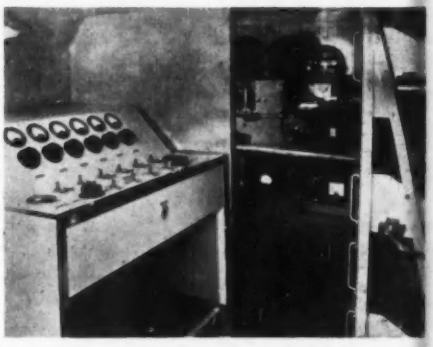
MOBILE recording vans are no novelty, but the idea of a mobile recording laboratory hire service seems to us to have interesting possibilities in the recording of transient phenomena outside the range of ordinary sound-track



Above: Exterior view of recording van

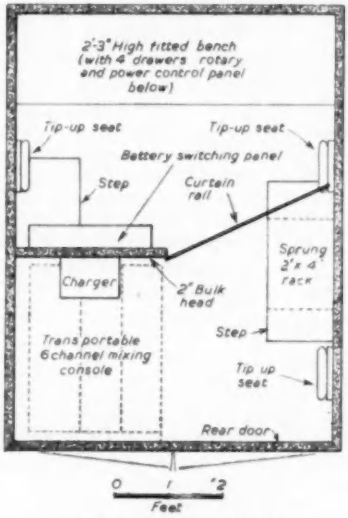
On left: The film recorder unit

Below: Interior view of the van, showing general arrangement of gear. On left is the mixer console, on the right are the sprung racks for amplifiers and power packs



work. The "N. & P." mobile laboratory, designed by Mr. C. E. C. Pontifex, A.M.I.E.E., has a number of novel features.

Built on a 30 cwt long-wheelbase Austin chassis, the body has outside dimensions of 16 ft long by 6 ft 10 in. wide by 7 ft 6 in. high, the walls being of double skin construction lagged with 2-3 in. thickness of Fibreglass, the floor being covered with ¼ in. cork matting. Special traps are arranged so that cables can be taken out to mobile microphones or loud-speakers.



Block plan of the laboratory

The interior, fitted so that one-half can be curtained off as a photographic dark room, has a work-bench running the full width, with fitted drawers for tools and accessories, while tip-up seats are provided for the convenience of the operators.

Power Supply

The equipment normally operates from 230 V single- and three-phase. Where this is not avail-

able, a ½ kVA rotary converter is used, operating from two sets of 48 V 80 A.h. batteries.

These are easily accessible for maintenance, one set being located under the passenger seat in the driving cab, while the other set is in a box slung from the underside of the wagon.

For charging, two independent rectifier units, a full wave metal rectifier and a Tungar valve unit are provided, each operating from 230 V single phase supplies. Where no external supply is available a small petrol-electric generator is provided.

Apparatus

The apparatus installed includes a film recording unit of the unilateral variable area type, operating up to 10 kc/s, a disc recording equipment, a six-channel mixing console, and an amplifier rack, which contains the necessary amplifiers and power packs for the recording units. All apparatus is designed to withstand rigorous working conditions, the amplifier rack being sprung, and the electronic and recording equipment is transportable if required. Public address gear of high fidelity is also fitted.

Crystal Rectifiers

New Miniature Type Available from G.E.C.

FOUR types of germanium crystal rectifiers for use in electronic circuits, indicating instruments, telephone apparatus, etc., have been introduced by the General Electric Co. Ltd., and are available for immediate delivery.

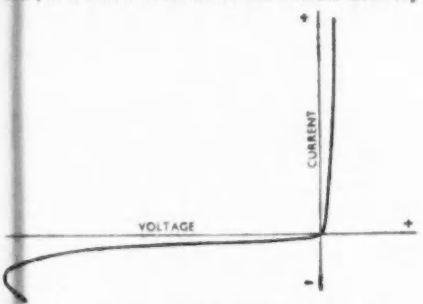


Fig. 1. Characteristic curve of rectifier

These rectifiers are very small in size, have low forward impedance and are designed to be soldered directly into a circuit so that no mounting or support is needed. Their life is indefinitely long and should be not less than that of equipment in which they are used.

In this type of rectifier, as distinct from silicon rectifiers, the outstanding advantage is the ability to withstand comparatively large voltages in the reverse direction, while maintaining a forward current (measured at + 1 V) corresponding to a conductance of 10 mA/V.

The slope in the reverse direction reaches a maximum value at about − 2 V. Beyond this the resistance falls slowly until at a particular voltage, known as the "turnover voltage," the slope falls to zero and then becomes negative, as shown in Fig. 1. Measurements of rectification efficiency at frequencies up to 100 Mc/s show that the efficiency falls with increasing frequency by an amount dependent on the turnover voltage; the higher the turnover voltage the lower the rectification efficiency. Because of this, crystals for use at the higher frequencies have a maximum and minimum "turnover voltage."

Stability

An important feature of germanium rectifiers is their remarkably high electrical and mechanical stability when subjected to shock or vibration. This is due to the junction between the metallic point and the crystalline germanium being treated during manufacture to obtain the optimum rectification characteristics and time stability. Afterwards the metal point is cemented to the germanium to prevent dislodgement by vibration. The whole is then sealed into a tough glass envelope with wired ends, as shown in Fig. 2. Colour coding is used to designate the four standard types of rectifiers.

All types will withstand a continuous forward current of 30 mA and a recurrent peak of 100 mA. There is little change of rectifier characteristics with temperature for the range 15° C to 50° C, but between 50° C and 100° C the forward and reverse resistances decrease slowly with increasing temperature.

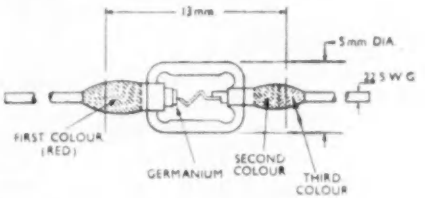


Fig. 2. Showing rectifier construction

THE WEEK

INDUSTRY *in news* COMMERCE

Obligations of Nationalisation

SPEAKING on "Obligations of Nationalised Industries" at North Western Fuel Luncheon club last week, Sir Joseph Hallsworth, chairman of N.W. Board, referred to the special obligations nationalisation Acts enjoined towards workers. Prior to his appointment to N.W. Board last May, Sir Joseph was a member of the National Coal Board, and he spent some time discussing the main obligations of the Act covering that industry.

Although there was nothing new in principle in the machinery to be set up for negotiation of terms and conditions, what was new, Sir Joseph said, was the co-option of the experience of the worker in problems of training and in organisation and conduct of the industry. Nationalisation was a great act of faith undertaken to secure a new attitude towards and within the industry.

Sir Joseph defined the duties of B.E.A. and the Area Boards as "to plan and carry out an efficient and economical distribution of electricity to persons in their area who require it." Electricity supply at the present time was hampered by shortage of plant and equipment for generation and distribution, all costing two and three times as much as pre-war and by restrictions on capital expenditure.

B.E.A.'s Outstanding Claims

NOTE was made last week of the writ issued by the British Electricity Authority against the Eastbourne Corporation, involving the sum of £4,229, which, it was stated, was transferred by the corporation in 1947-48 from the unappropriated profits of the electricity undertaking to the relief of the general rate. It is understood that the B.E.A. has issued such writs to a number of other municipalities in regard to similar outstanding matters, but there is no suggestion of action being taken in the courts at this stage. It has been made clear that this step has been undertaken by the B.E.A. as a legal precaution in order to keep the matter open, for in several instances discussions have become extended and likely to outlast the period of limitation stipulated under the Act.

Dispute over Reserves

REPRESENTATIONS are being made to the Minister of Fuel and Power by S.E. Scotland Board that full credit should be allowed them for the £1,179,000 local authority general reserves taken over at vesting date. At a meeting of the area's consultative council last week the chairman, Mr. J. M. Airlie, said that so far only an acknowledgment of the letter had been received.

At vesting date (April 1, 1948) electricity undertakings in the area held reserves amounting to over £2 million — £950,000 company and £1,162,000 local authority. The Board do not regard it as essential that the actual investments and cash should be returned. Instead they suggest that the Central Authority should retain the investments and cash, but give full credit by making a deduction from the amount of the board's indebtedness to the authority as calculated at vesting date.

Scientists Meet in Birmingham

SINCE foundation in 1831, the British Association has on five occasions held its annual meeting in Birmingham. This year, on the joint invitation of the City and University, it will do so again. The president will be Sir Harold Hartley.

The programme commences on August 30, the 13 sections being arranged with regard to the public interest as well as the purely scientific importance of the topics discussed. A preliminary programme is to be issued this month and may be obtained from the Joint Local Secretaries, British Association, Council House, Birmingham 1.

Need for Electricity

WARM tributes to the work of E.A.W. and its founder, Dame Caroline Haslett, were paid by Mr. S. F. Steward, chairman of S.W. Board, at the 21st Birthday Dinner of Bristol E.A.W. branch last week. In proposing the toast of the Association and its founder, Mr. Steward said that, after doing valuable work for war charities

The First Half-Century

The paper by Mr. C. E. Grove was an indictment of the Admiralty respecting its neglect of electricity. The Admiralty had had little to do with putting electric lighting into the Navy. It had first been introduced into a Brazilian ship and an Admiralty official had chanced to have an opportunity of seeing it there, whereon they adopted all the details and paid no royalty to the engineer. The Admiralty pattern of projector was the worst in the world. Owing to its great focal length it was necessary to incline it to prevent the carbons throwing a shadow in the beam. An inclined lamp was an abomination, it had to be worked by a bluejacket exposed to the enemy's fire.— *From our issue April* 12, 1900.

Main showroom windows of the Yorkshire Board at Leeds currently features Carron "11" series electric cookers

and assisting with the recent fuel economy campaigns, the E.A.W. could now revert to its original purpose of encouraging the fullest possible use of electricity in the home.

Although the peak load problem was likely to continue for a few years more, at all off-peak hours there was abundant electricity. The need for labour-saving in the home was much greater than it was twenty-one years ago. Cleanliness was accepted as of paramount importance; electricity was the housewife's most efficient help, and was the cleanest form of energy. Domestic load, Mr. Steward stressed, was not entirely responsible for the peak, as many appliances, including cookers, were mainly used outside peak-hours. If the S.W. Board could fill in the valleys of the load curve and increase revenue earned by their existing system, electricity costs would be kept down.

Responding, Dame Caroline declared that electricity was the answer to housewives' problems. The Association was pleased to hear that "the Electrical Age is really coming back again." "The only way the nation can survive and have a decent way of living," said Dame Caroline, "is by substituting to a large extent electrical energy for human energy."

Canadian Water Power

THE Water Resources Division, Development Services Branch, Department of Resources and Development, Canada, has now issued its annual review of the potentially available and of the presently developed water powers of Canada. The latest available information regarding water power in each province is summarised and a brief discussion of overall resources is given under such divisions as provincial distribution, current progress in development, growth of development, general utilisation and relationship of development to population.

The present recorded water-power resources of Canada, including the new province of Newfoundland, are shown as totalling nearly 27 million horse-power under conditions of low stream-flow and nearly 43 million horse-power at average flow, the latter figure representing a feasible turbine installation of over 55 million horse-power. The total turbine installation at the end of 1949 is given as 11,613,333 h.p., indicating that only 21% of available resources has been developed. During 1949, hydro-electric construction was most active with 480,565 h.p. of new capacity coming into operation and with good progress being made on other new developments; additional projects were being investigated or planned. About 90% of hydraulic plants serve as central electric stations and, in 1949, with production reaching a new high level, a high primary demand curtailed the use of secondary power. The pulp-and-paper and the mineral industries are the more important consumers of hydraulic power. The installed capacity of water-power plants in Canada now equals 857 h.p. per thousand of population.

Copies of this review may be obtained free of charge on application to the Chief, Water Resources Division, Department of Resources and Development, Ottawa.

Distributors Discuss Sales

IN PICTURESQUE Palace Hotel, Buxton, some 200 Kelvinator distributors from all parts of Great Britain recently met to discuss sales for the coming year. A two-day convention—the first Kelvinator have arranged since the war—began with lectures by executives of the company.

Distributors were shown five of the new models for the coming season, including a fish cabinet, a bottle cooler, service cabinet and two types of domestic refrigerator. The convention concluded with a banquet and cabaret.

Electrical Machine Analysis

ELECTRICAL machine analysis was the subject of a colloquium at Imperial College, London, on Monday and Tuesday April 3 and 4. It was attended by some forty engineers, drawn from industry, the universities and technical colleges. The first session, under the chairmanship of Professor Willis Jackson, D.Sc., D.Phil., M.I.E.E., of Imperial College, was devoted to a review of present-day analytical

methods. The discussion was opened by Professor M. G. Say, PH.D., M.SC., M.I.E.E. (Edinburgh), who surveyed the two-axis approach to electrical machines, and Mr. S. Neville, B.SC.(ENG.), (M.V.), who made some suggestions concerning the method of obtaining machine parameters from design data. Further discussion emphasised that few parameters are constant for all conditions of operation.

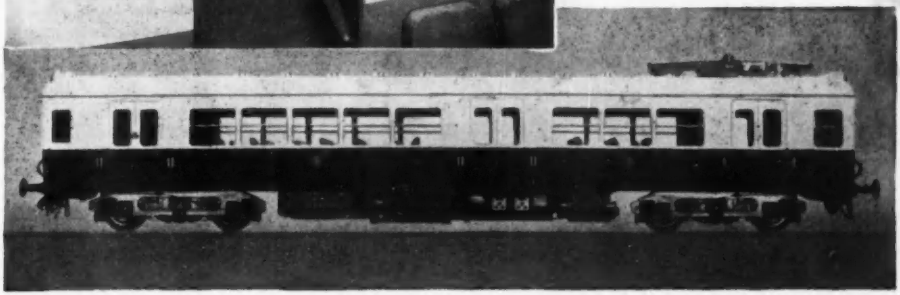
At the second session, Mr. B. Adkins, M.A., M.I.E.E. (B.T.H.), opened a discussion on the transient performance of synchronous machines and developed a set of equations for their performance. Professor G. H. Rawcliffe, M.A., D.SC., M.I.E.E. (Bristol), followed and referred to the many testing techniques available for determining the several reactances required for transient analysis, and the difficulty of reconciling their several results. A dinner was held on the Monday evening and was followed by an informal discussion on co-operation between industry and the universities on the advancement of methods of machine analysis.

The use of matrix methods for machine analysis was introduced in the third session by Mr. M. W. Humphrey Davies, M.SC., A.M.I.E.E. (Imperial College). He was followed by Mr. W. J. Gibbs, M.SC.(ENG.), M.I.E.E. (B.T.H.), who demonstrated a powerful method for the practical solution of problems concerning the performance of most types of electrical machine. It was based on the two-reaction concept and used a simplified matrix technique. Final session was opened by Mr. L. D. Anscombe, M.A., M.I.E.E., of the British Thomson-Houston Co., who introduced a discussion on the possibilities of a general approach to machine analysis.

Enterprise at Enfield

WITH THE title of "Enfield Can Do It" an industrial exhibition was opened on Easter Saturday at Enfield Technical College, the opening ceremony being performed by Mr. E. S. Prentice (Chief of Trade Division, E.C.A. Special Mission to the United Kingdom). About 100 firms took part.

Enfield being a highly-industrialised area, with a factory load of some 25 MW, it was only natural that the Enfield District of the Northmet Sub-Area (E.E.B.) should play a prominent part, and their exhibits filled four rooms. The first, devoted to generation and transmission, included scale models of power stations, a selection of photographs, and examples of high-tension cable joints and transmission apparatus. Domestic appliances and industrial apparatus filled another two rooms, while the fourth was devoted to farming equipment, since the district, although predominantly industrial, has a considerable number of farms, and soil heating equipment, pumps, hay-drying equipment and other farming appliances were displayed. The exhibit was arranged in



Left: Interior of a second-class coach, and below: a complete first and second-class coach, part of the rolling stock G.E.C. are supplying for Estoril railway in Portugal (see our 16th March issue). The whole order includes two first and second-class motor coaches, two second-class and three third-class trailers. The line runs for 15¾ miles, connecting Lisbon with the holiday resorts of the Tagus estuary

conjunction with Area and Sub-Area authorities, and a number of commercial firms co-operated in the provision of the equipment.

Other firms who had stands in the exhibition, which was attended by 4,000 people on the opening day, included Ripaults Ltd.; The Enfield Tool Co. Ltd.; Enfield Cables Ltd.; Murex Welding Processes Ltd.; Enfield Rolling Mills Ltd.; Ferguson Radio, Thorn Electrical Industries Ltd.; Belling and Co. Ltd.; Belling and Lee Ltd.; Sangamo Weston Ltd.; and The Ozalid Co. Ltd.

One of the interesting features at the Enfield exhibition was this watch rate recorder

NEWS IN BRIEF

Biggest attraction for crowds visiting the Netherlands Trade Fair at Utrecht was the colour television demonstration staged by Pye, Ltd. When the Fair closed on March 30, the equipment was flown to Italy where on April 12 it will be seen at the Milan Trade Fair.

N.W. Board's stand at Manchester Brighter Homes exhibition attracted 1,026 inquiries during the seventeen days of the show. In addition, 4,150 people saw cookery demonstrations.

Seventh in Great Britain, a new atomic energy establishment is to be constructed at Aldermaston, near Reading, on a former bomber airfield.

An "H. Hooper memorial prize" of two guineas per annum for each of the student sections of South Midland I.E.E. centre will commemorate the work of the late Mr. H. Hooper, for 27 years hon. secretary of the centre.

When fifty matrons and other hospital officials visited the London Building Centre last week they were shown this automatic washing machine in the electrical section

Their first production since the war, Glovers' Dramatic and Operatic Society staged *Black Limelight*, a thriller by Gordon Sherry, in Chandler Hall, the new works theatre.

American and Canadian visitors are now excused purchase tax on all classes of goods bought in Britain. Formerly tax exemption coupons were only available for clothing.

Cases in Court

Claim for loss of Salary and Pension

Mr. J. Paterson has won his case for £52,408 as compensation for salary and pension of which he was deprived through the functions of the Clyde Valley Electrical Power Co. being taken over by the South West Scotland Electricity Board. Lord Birnam, of the High Court of Scotland, has granted a decree for the full amount. The action against the Board was raised by J. Paterson, who became general manager of the Clyde Valley Electrical Power Co. on January 1, 1939, and continued to act in that capacity, and also as a director of the company, until April 1, 1948, when the functions of the company were taken over under Statute by the defendants.

It was a matter of admission that the defendants were liable to pay Mr. Paterson whatever compensation he might be found entitled to in accordance with the terms of the agreement. The question in dispute was the amount of compensation.

Lord Birnam, in his judgment, said that Mr. Paterson's salary at the date when his employment was terminated was £6,000 per annum. If he had been in receipt of that salary at the natural expiry of the agreement—that was, on January

1, 1954—he would have been entitled to a pension at the rate of £3,000 per annum.

According to the evidence of two actuaries of the highest eminence in their profession, the actuarial value of a life pension of £3,000 per annum, payable to a man of the plaintiff's age, would be £22,832. That figure, together with the actuarial value of the salary payable to him until January 1, 1954, made up the amount sued for. The agreement stipulated for a minimum salary of £4,500, and it was contended that Paterson's compensation must be calculated on the basis of that minimum salary and a corresponding pension of £2,250. In his lordship's judgment, that argument was unsound. It was possible that the salary might have been reduced before January 1, 1954. It was also possible, and, indeed, more probable, that his salary would have been increased.

Misrepresentation Alleged

Epheta Manufacturing Co. (Elements), Ltd., were awarded judgment in the King's Bench last week against Tricity Cookers Ltd., on a claim for damages for alleged misrepresentation in connection with the sale of micronic wire coils supplied by British Driver-Harris Co. Ltd. If the amount of damages was not agreed, the matter was to be decided by the King's Bench Master.

In an action by Tricity Cookers Ltd. against Dunedin Holdings (London), Ltd., a company controlling the Epheta Co., Mr. Justice Lloyd Jacobs gave judgment for the plaintiffs for the agreed amount, with provision for a set off. The Tricity Co. were ordered to pay the Epheta's costs.

The judge found that the Tricity Co. had included in their prices a commission to a former employee of British Driver-Harris Co., but in increasing their prices, had represented that they did not include the payments of commission. They said the increase was due to increased costs of labour and materials, which it had been established was not true.

Mr. Justice Lloyd Jacob indicated that the measure of damages was the amount improperly paid in commission to the former employee of British Driver-Harris Co., who had since died.

Questions in Parliament

Nationalised Industries

Answering a query, Mr. H. Morrison rejected a request for an all-Party committee to examine the subject of which questions on nationalised industries should be answered by the respective Ministers in the House. Mr. J. Henderson Stewart, who raised the matter, had pointed out that the present Government policy, whereby Ministers refused to answer questions dealing with the day-to-day administration of nationalised industries, frequently deprived members of the opportunity of challenging Ministers on matters of public importance. Mr. Morrison, however, replied that the admission of such questions would be inconsistent with the principle that the Boards should be free from detailed Ministerial or Parliamentary supervision of their commercial operations. He recalled that the Speaker had ruled in 1948 that he would be prepared to exercise his discretion to direct acceptance of questions asking for statements to be made on matters about which information had been previously refused. Dissatisfied with the answer, Mr. Stewart declared he would raise the matter on the adjournment.

London Trams Conversion

In reply to a question, Mr. Barnes said the conversion of the South London tram to bus operation services would start in the autumn of this year, and the programme completed in 1952.

Parliament's Fuel Bill

Sir Herbert Williams asked the Minister of Works the reasons for the increased cost of fuel, gas and electricity for the Houses of Parliament buildings from £22,700 in 1949-50 to £33,500 in 1950-51. Mr. Stokes answered that he anticipated increased electricity consumption in 1950-51 for the new Chamber and other new accommodation, and also to maintain the recently restored pre-war lighting standards. Provision was also made for a full year's supply of oil fuel for the new boiler as compared for only a short period in 1949-50. The cost of coal which was previously used was met for technical accounting reasons from Subhead L of the Vote for Miscellaneous Works Services.

Distribution of Industry Bill

During discussion on the Second Reading of the Distribution of Industry Bill, Mr. MacLeod drew attention to the position of the Scottish Highlands. Why should any industrialist go into that area unless he was offered special advantages, he asked? He asserted that at the present time all the costs of production in that area were higher than in any other region of Gt. Britain. In regard to hydro-electric power, he suggested that the North of Scotland Board make a surcharge to industrialists in the south and lower the rate to industrialists who went north. He was aware of the difficulties facing the Board, and that the hopes of attracting electro-chemical or electro-metallurgical industries were very slight because the costs of construction of hydro-electric schemes were becoming so high.

P.T. on Batteries

Mr. D. Marshall asked the Chancellor of the Exchequer if he would, while preparing his Budget, consider the removal of purchase tax from dry batteries. Sir Stafford Cripps replied that, while he was always prepared to consider any matter brought forward, he would not anticipate his Budget statement.

Electric Supply News

Belfast

The Corporation Electricity Committee has authorised the town solicitor to lodge an appeal against the valuation of the electricity undertaking. The city electrical engineer had reported receipt of notification from the Commissioner of Valuation that the rateable valuation of the undertaking had been assessed at £76,685, as from April 1, 1950, an increase of £16,600.

Burton-on-Trent

The British Electricity Authority has received the consent of the Minister of Fuel and Power to the establishment of a new power station at Drakelow, near Burton-on-Trent. The first section of the station covered by the consent will comprise two 60 MW turbo-alternator sets and two boilers each of an evaporative capacity of 515,000 lb/hr, and one cooling tower. The station will have an ultimate installed capacity of 240 MW.

Eire

As the first step for bringing electricity to Co. Donegal, the Electricity Supply Board proposes to erect a main 38,000 V transmission line from the Erne station at Ballyshannon, via Donegal town and Ballybofey to Letterkenny. This project will enable development to proceed, not only in Letterkenny, Convoy and Lifford, which are at present supplied by the Electricity Board of Northern Ireland at Strabane, but in other towns in the region.

In addition, rural areas in this region will be canvassed, and, if the returns are sufficiently good, supply will be arranged under the rural electrification scheme.

Lewis

Since April, 1948, the number of consumers in Lewis had increased from 1,063 to 2,014, and new consumers were being added at the rate of 126 a month, Mr. C. Price declared when opening an exhibition of electrical appliances in Stornoway last week.

North of Scotland

The Secretary of State for Scotland has confirmed a scheme prepared by the North of Scotland Hydro-Electric Board for the erection of overhead transmission lines to run from Aberdeen to Dundee and link up power supplies in those cities. The lines will run from a transforming station now being erected at Craigiebuckler, Aberdeen, through the counties of Aberdeen, Kincardine and Angus to an existing transforming station at Strips of Craigie, Dundee. The scheme is estimated to cost £372,000.

North Western Board

Domestic consumers to whom the Clow surcharge applied are to be given a rebate of 0·18d. p.u. during the quarterly period following the first meter reading after April 14.

S. Western Board

Commenting on the view of Alderman Miller "that the Board was over-capitalised in relation to the revenue it received" the South Western Electricity Board has stated that the networks and properties which must be maintained are necessarily both extensive and costly in relation to the revenues which they can produce. It is pointed out that the Board's area has a lower density of population than any other, with comparatively little industrial concentration to help to balance the position. Therefore, unless further rural electrification in the area could be given some special financial assistance, the Board would have a difficult problem in carrying out full development while keeping general tariffs to a minimum.

South Wales

The Board has recently completed negotiations for the acquisition of a small bulk supply of electricity from the Birmingham Corporation's water undertaking at Elan Valley. The Corporation at present has two small generating sets at Caban-Coch dam, and it is proposed to substitute these with two larger sets. After meeting the requirements of the waterworks, the surplus energy generated, estimated at 1·4 million units per annum, will be available to the Board.

Yorkshire

As a further step in the rural electrification programme of the Yorkshire Electricity Board, supplies were switched on recently to four more villages—Ringinglow, Leedsham, Cowthorpe and Hainton. From the first-named village, in No. 3 sub-area, applications for a supply were received respecting 38 of the 39 premises. At Leedsham and Cowthorpe (No. 4 sub-area), applications were received to supply all the 38 premises in the first-named, and 23 out of 28 premises in the latter. Work is going on with connecting up installations at the larger village of Hainton, in No. 7 sub-area, where there are 120 premises which could take a supply.

LIGHTING SCHEMES

Peterborough.—The Highways Committee has approved a scheme for the improvement of street lighting on Mayor's Walk and Thorpe Park Road, by the provision of 80 W mercury vapour lamps.

Skelton (Yorks).—On the recommendation of the North Eastern Electricity Board, the U.D.C. is to carry out a scheme for replacing electric street lights. The Board stated that of 739 lighting units, 518 should be repaired or renewed, at an estimated cost of £3,289.

Skipton.—The R.D.C. has submitted to the M.o.T. schemes for electric lighting of the main streets at Sutton and Cowling, at an estimated cost of £2,177.

Stockport.—The Ministry of Transport has suggested that the plan to convert all the town's street lighting from gas to electricity should be spread over a period of years.

Company Activities

J. Booth & Co.

Consolidated profit and loss account for 1949 shows a balance of £271,070 (*£120,611*) after taking into account provision for taxation no longer required £224,825 (*nil*). Applicable to the parent company is £225,177 (*£111,093*), to which is added £211,422 brought in. To stock reserve £30,000, reserve for re-equipment, development, etc., £60,000, additional depreciation of fixed assets, dividend of 20% £82,500, leaving £222,939 carried forward.

Crofts Engineers (Holdings)

The full accounts show a group trading balance of £632,995 (*£535,668*), plus investment income £204 (*£1,850*), making £633,199 (*£537,518*). Directors' emoluments absorb £15,518 (*£14,083*), depreciation £42,439 (*£62,662*), audit fee £998 (*£997*), debenture interest nil (*£1,031*), taxation £305,182 (*£245,767*), leaving a net profit of £269,062 (*£212,978*), with £17,265 brought in there is £286,327 (*£526,269*) available. To general reserve £150,000 (*nil*), to stock reserve £30,000 (*nil*), Preference dividends £13,750 (*£1,146*), Ordinary dividends £77,000, profits of subsidiaries prior to acquisition nil (*£434,975*), written off goodwill nil (*£5,000*), leaving £15,577 carried forward.

Franco Signs

Consolidated trading profit for the year to September 30 last was £43,197 (*£25,314*), plus sundry credits £4,267 (*nil*), transfer from contingencies nil (*£5,000*), making £47,464 (*£30,314*). To directors' emoluments £7,378 (*£7,999*), bank and other interest £8,616 (*£7,151*), written off stock and other losses nil (*£21,482*), tax £3,135 (*£609*), leaving balance of profit attributable to interests of Franco Signs, £12,853 (*loss £14,952*). With £29,148 (*£44,087*) brought in, there is £42,001 available. To dividend 3% (*nil*) £4,620, leaving £37,381 carried forward.

Radio and Television Trust

Consolidated loss of the group for the year to March 31 last, excluding losses on disposal of radio interests and the results of subsidiaries which have since been sold, or ceased to be subsidiaries, amounted to £47,039 (*profit £176,973 for 1947-48*). Taxation of £46,765 and the interest of minority shareholders have been charged in the above figures. Losses on disposal of radio interests not included were £295,220 (*£70,399*), of which £97,802 has been absorbed by reserves of the holding company. Group loss for the year was £244,457 (*profit £106,574*).

A. Reyrolle & Co.

For 1949 group trading profit was £1,356,954 (*£757,589*), plus other income £60,609 (*£50,128*), making £1,417,643 (*£807,717*). Depreciation absorbs £67,767 (*£68,320*), directors' fees £1,600 (*same*), staff superannuation £31,742 (*£30,769*), provision for employees' benefits £10,000 (*same*). Loan interest £5,274 (*£21,774*), profits tax £160,000 (*£90,000*), income tax £542,570 (*£281,656*), reserve for future income tax being relief obtained from initial allowances £11,015, leaving a profit of £587,675 (*£303,598*), of which £468 is retained in accounts of one subsidiary. To general reserve £200,000 (*£25,000*), development and expenditure account £100,000 (*£50,000*), stores and work in progress reserve £75,000 (*£65,000*), renewal account £75,000 (*£40,000*). Ordinary dividend 15% (*12½%*), takes £83,956 (*£69,964*), preference dividends £21,546 (*same*), leaving £162,270 (*£158,480*) carried forward. In his report, Sir Claude Gibb emphasises that 1949 was an exceptional year for the company in many respects. Several large contracts received in earlier years were completed and brought into the year's accounts. The easing of the material supply position enabled the works to achieve their production targets with a minimum of last-minute rushing and overtime, and large batching of similar products was possible to a degree not likely to be repeated to the same extent in a keen buyers' market with a growing demand for shorter delivery periods.

Telegraph Construction and Maintenance Co.

Trading profit for 1949 amounted to £271,080 (*£294,530*) after charging £19,948 to reserve for research and development. With investment income, etc., total income for the year was £312,183 (*£325,927*). Provision for depreciation £64,011 (*£43,083*), taxation £102,053 (*£127,886*), leaving net profit of £140,892 (*£148,440*). Reserves receive £100,374 (*£100,000*), including £45,000 (*£25,000*) to reserve for research and development. Dividends absorb £42,990 (*same*), leaving £63,591 (*£66,063*) carried forward. Consolidated net profit was £147,319 (*£151,820*), and balance carried forward by the group £75,484 (*£71,769*).

Telephone and General Trust

Group profit for 1949, after all charges including taxation, was £125,531 (*£139,927*). Taxation absorbs £109,601 (*£106,658*). Group profit attributable to members of holding company after deduction of outside interests £105,874 (*£124,505*). Preference dividend £21,175, interim Ordinary dividend 3% £10,345, and final 5% £17,243, dividend on "A" Ordinary 8% £4,400 (*all same*). Profit of holding company, subject to income-tax, is £163,784 (*£142,024*). To contingencies reserve £37,500 (*£40,000 to revenue reserve*), leaving £100,094 (*£103,505*) carried forward.

Dividends Declared

Cable and Wireless (*Holding*). Ordinary dividend of 4%, payable on June 9. Group profit, after providing £1,629,000 for U.K. taxation, is £1,324,000.

Senior Economisers. Final dividend of 25% (*45%*) on increased capital, making 60% (*70%*).

Commercial Information

CONTRACTS OPEN

HOME

Apr. 14.—Belfast T.C. Renewal and re-adjustment of 33 kV, 760 MVA and 500 MVA switchgear and accessories for existing Reyrolle switchgear. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1. Deposit £5 5s. (See our Mar. 16 issue.)

Apr. 14.—Glasgow T.C. Twelve months' supply of electrical fittings and accessories. Lighting Dept., 20 Trongate, Glasgow.

Apr. 14.—Stockport T.C. 148 pre-cast concrete columns, lanterns and 250 W mercury vapour lighting equipment. Wm. F. Gardner, Borough Surveyor, Town Hall, Stockport. (See our Mar. 30 issue.)

Apr. 14.—Sunderland T.C. Electrical installation for Hill View primary infants' school. Architects, Matkin and Hawkins, Barclay Chambers, Fawcett Street, Sunderland. Deposit £1 1s.

Apr. 15.—Bradford T.C. Electrical installation, lighting and heating at Woodroyd School for Education Committee. City Architect, Town Hall, Bradford.

Apr. 15.—Kircardine C.C. Electrical work for erection of nurses' house in Ramsey Rd., Banchory. County Architect's Office, 34 Market Square, Stonehaven.

Apr. 15.—Lewes T.C. Wiring in conduit for lighting points in public conveniences, Weston Rd. C. T. Butler, Borough Surveyor, Town Hall, Lewes.

Apr. 15.—Manchester T.C. Repairs to electrical installation after war damage at Burnage High School for Boys, Levenshulme. City Architect, Town Hall, Manchester. Deposit £1 1s. (See our Mar. 16 issue.)

Apr. 15. — Manchester T.C. Oscillograph equipment, laboratory instruments, audio-frequency oscillators, and relays for Municipal College of Technology extension. Principal College of Technology, Manchester 1. (See our Apr. 6 issue.)

Apr. 15.—Oldbury T.C. High pressure mercury vapour electric discharge lighting on Birmingham-Wolverhampton Road between Birchfield Lane and Borough boundary at Bury Hill. Borough Engineer, Municipal Bank Chambers, Oldbury. Deposit £2 2s.

Apr. 15.—Samford R.D.C. Installation of 19 electric cookers on council's housing sites. Building Surveyor, Council Offices, 25 London Road, Ipswich.

Apr. 17.—Camberwell T.C. One electrically driven tenoning machine. John Clapp, Borough Engineer and Surveyor, Town Hall, Camberwell, S.E.5.

Apr. 17.—Nottingham T.C. Replacement of electrically driven booster pumps at Normanton-on-the-Wolds. B. W. Davies, Engineer and General Manager, Water department, Castle Boulevard, Nottingham.

Apr. 17.—Portrush. Electrical installation on behalf of N. Ireland Hospitals Authority at Hopefield Hospital, Portrush. F. W. Parkinson and Partners, 93 Ann Street, Belfast.

Apr. 18.—Edinburgh T.C. Electrical installation for alterations at Central Library, George IV Bridge. City Architect, City Chambers, Edinburgh.

Apr. 18.—Kingsclere and Whitchurch R.D.C. Electrically driven booster pump for Ashmansworth pumping station. Council's Surveyor, R. A. Over, Council Offices, Kingsclere, Berks.

Apr. 18.—Kirkcaldy T.C. Electrical work for 36 flats to be erected in Winifred Crescent. Measurers, James Gentle and Son, 162 High St., Kirkcaldy.

Apr. 18.—Witney U.D.C. Electric light and power installations for 46 dwellings on Eastfield Rd. estate, Hailey Rd. A. T. Green, Engineer and Surveyor, Council Offices, Church Green, Witney.

Apr. 19.—Southport T.C. Electrical installations in 18 houses to be erected at Site No. 12, Grantham Rd. Borough Engineer, Town Hall, Southport.

Apr. 20.—Lockerbie T.C. Provision of street lighting on trunk road A74, comprising erection of 47 columns, brackets, lanterns and 140 W sodium electric discharge lamps. G. Stevenson, Town Clerk, Town Hall, Lockerbie. Deposit £2 2s. (See our Mar. 23 issue.)

Apr. 20.—Peterborough T.C. Installation of electric lighting in temporary buildings on ex-W.A.A.F. site, Westwood Aerodrome. City Engineer, Town Hall, Peterborough.

Apr. 21. — Bournemouth T.C. Installation of 2 pairs of electrically operated passenger lifts each capable of carrying 30 passengers for use on sea front at Woodland Avenue, Southbourne, and Manor Road West. Borough Engineer, Town Hall, Bournemouth. Deposit £2 2s.

Apr. 21.—N. Scotland H.E. Board. Construction of 250 miles of wood pole overhead distribution lines in Island of Skye. Kennedy and Donkin, Engineers, 12 Caxton St., S.W.1. Deposit £2 2s. (Advertised in this issue.)

Apr. 22.—Consett U.D.C. Network for provision of street lighting. T. Hutton, Surveyor, Council Offices, Medomsley Road, Consett, Co. Durham.

Apr. 24.—Bootle T.C. Sodium lighting equipment comprising lamps, lanterns, control boxes, line switches, pole, brackets and conductors. Borough Surveyor, Town Hall, Bootle.

Apr. 24.—Lincoln C.C. Maintenance of electric refrigerators, potato peeling machines, and mixing machines, for education committee. J. E. Blow, Clerk of the County Council, County Offices, Sleaford, Lincs.

Apr. 28.—Belfast T.C. 6,600 V and 400 V auxiliary switchgear and accessories for Harbour power station. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1. Deposit £5 5s. (See our Mar. 23 issue.)

Apr. 28. — Manchester. New electrically operated passenger lift for College of Technology. The Chairman, College of Technology Sub-committee, Education Offices, Deansgate, Manchester 2.

Apr. 28.—Reigate T.C. Electrical rewiring of Town Hall. G. G. Sanderson, Borough Surveyor, Town Hall, Reigate. Deposit £2. (See our Apr. 6 issue.)

May 1.—Hitchin U.D.C. Electrical installation for 28 houses on Purwell Lane estate. Surveyor, Council Offices, Brand Street, Hitchin. Advertised in this issue.

May 1.—Metropolitan Water Board. Five electrically driven inclined spindle low lift pumps for pumping station at Chingford South Reservoir. Chief Engineer's department (Room 122), Offices of the Board, New River Head, Rosebery Avenue, E.C.1.

May 1.—N. Scotland H.E. Board. Erection of 8½ miles of 33 kV single-circuit wood pole overhead lines near Killin, Perthshire. Engineers: Merz and McLellan, 39 Northumberland Street, Edinburgh 3. Deposit £1 1s. (See our Apr. 6 issue.)

May 1. — N. Scotland H.E. Board. 11 kV and lower voltage single circuit wood-pole overhead distribution lines in the parish of Kilmarnock, Dunbarton. Engineers: Merz and McLellan, 39 Northumberland St., Edinburgh 3. Deposit £1 1s. (See our Mar. 30 issue.)

May 12.—Belfast T.C. 33 kV and lower voltage transformers and CO_2 firefighting equipment. Merz and McLellan, Engineers, Carliol House, Newcastle-upon-Tyne. Deposit £5 5s. Advertised in this issue.

June 23.—Durban. E.H.T. switchgear for 3 sub-stations; 33 panels for Mobeni, Parkhill and Roberts substations, each 6,600 V 250 MVA. Electricity Depart., City of Durban, S. Africa. B.o.T. (Ref. CRE (IB) 48932/50)*.

No date stated.—Aberdeen. Electrical engineer work for addition of third storey at main building for Governors of Robert Gordon's technical college. J. A. O. Allan Ross and Allan, Architects, 10 Bon-Accord Square, Aberdeen.

No date stated.—Kelso T.C. Electrical installation work for 23 houses at Inchmyre site. Town Clerk, J. Pennie, Kelso.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Apr. 24.—Wellington. Cable, watt meters, ammeters, voltmeters, and micrometers. Stores Division, New Zealand G.P.O., Wellington.

May 1.—Pakistan. Switchgear, transformers and line equipment for Dargai H.E. scheme in N.W. Frontier province. Director of Supplies (Engineering), Dept. of Supply and Development, Government of Pakistan. B.o.T. (Ref. CRE (IB) 47419/50).*

May 2.—Montevideo. 1,750 wall telephones, and 3,400 desk telephones, magneto types with local battery. Administracion General de las Usinas Electricas y Telefonos del Estado, Montevideo. B.o.T. (Ref. CRE (IB) 47905/50).*

May 3.—Brisbane. Two 66 kV 110 V voltage transformers, two 66 kV 40/20/5 amp. current transformers and one kW-hr meter, for Wide Bay Regional Electricity Dept., Queensland State Electricity Commission, Brisbane. B.o.T. (Ref. CRE (IB) 47919/50).*

May 4.—Montevideo. 6 radio receivers (superheterodyne). Direcion General de Communicaciones, Montevideo. B.o.T. (Ref. CRE (IB) 47857/50).*

May 5.—Brisbane. 6 manually operated 33 kV 400 A air break switches, 45 33 kV 400 A single throw isolating switches. Department of Electricity, City of Brisbane. B.o.T. (Ref. CRE (IB) 47941/50).*

May 11.—Johannesburg. Various types of electrically heated furnaces for S. African Railways and Harbours' new plant at Keedoespoort. Chief Stores Superintendent, P.O. Box 8617, Johannesburg.

May 15.—Johannesburg. 20 kV 250 MVA switchgear (Contract D24/50) Room 19, Head Office, Electricity department, President Street West, Johannesburg, S. Africa. Deposit £3 3s.

May 24.—Australia. High and low pressure steam and water valves for Wide Bay Regional Electricity Board, Queensland. State Electricity Commission, Scottish Union House, Eagle Street, Brisbane.

May 25.—Sydney. Oil immersed current-limiting reactors for city substations. Specification No. 1348. General

Your Queries — Answered

"Bedal Aerofrige" refrigerator, makers of? E.E.—These were made by British Electrical Domestic Appliances (1938), Ltd., a firm which has been taken over by Thorn Electrical Industries, Ltd., 105-109 Judd Street, Kings Cross, London W.C.1 who should be able to supply spares. (17929)

Farm pressure cooker for 3 cwt of potatoes, makers of? G.D.—James Slater and Co. (Engrs.), Ltd., 50 Wells Street, London W.1, put forward their 200-lb steamer. (17939)

"Sunray" Hoover heaters, makers of? G.D.—Tubo Metal Products, Ltd., 32-44 Brewery Road, N.7. (17943)

"Renat" lighting fittings, makers of? T.E.—New Endeavour Eng. Co., Ltd., 4 Avenue Road, London N.W.10. (17949)

"Neoprene" tape, makers of? T.E.—This is the name given to a synthetic rubber by Imperial Chemical Industries, Ltd., 2 Buckingham Gate, London S.W.1, it is moulded in many forms by a number of concerns. (17934)

"Ajax" insulated staples, makers of? T.E.—Carlyle Chirm and Co., Ltd., Heath Field Works, Manor Drive, Spring Hill, Birmingham 18. (17959)

"Drydenair" radiator, makers of? T.E.—Thos. Dryden and Sons, Ltd., Grimshaw Street, Preston. (17954)

The above are selected from questions we have answered this week. If you have a query, send it to us

ANSWER WANTED

"Compex" battery sealing compound, makers of? T.E. (17965)

Manager, Sydney City Council. Deposit £220.

May 30.—Wellington. Two 80-ton four-motor electric overhead travelling cranes for Whakamaru power station Contract 150. State H.E. Dept., Wellington. Deposit £100; bond £550.

June 1. — Sydney. 13,500 kVA power transformers for Concord, City North and Waterloo substations. Specification No. 1361. Comptroller of Stores, Old Electricity Building, St. Andrew's Place, Sydney.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	153 0 0	£140 0 0
Delivered in 2nd and 3rd month after order	154 10 0	—
Delivered in 4th, 5th and 6th month after order	156 0 0	—
LEAD, good soft pig (foreign)	84 0 0	84 0 0
" " " "English" quality	85 10 0	—
Delivered in 2nd and 3rd month after order, plus	1 0 0	—
TIN (99·99·75%) (Cash)	592½-592¾	—
" (3 months)	594-594½	—
ALUMINIUM, commercial purity (del.)	112 0 0	—
ZINC	85 10 0	84 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.)	39 10 0	—
Mild Steel Tape (0·04 in.)	26 0 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Carol Manufacturing Co. Ltd.—A. E. Attwood, 20-21 Lawrence Lane, Cheapside, E.C.2, appointed liquidator at creditors' meeting on Mar. 30.

Maida Vale Electric Co., Ltd.—Petition for winding up presented at High Court of Justice on Mar. 27 by J. Love-Smith, of Cherry Tree Farm, Debenham, Stowmarket, Suffolk. Petition directed to be heard at Royal Courts of Justice on Apr. 24. Creditors or contributories may obtain copy of petition from Jas. H. Fellowes, 18 Doughty Street, W.C.1, solicitor for petitioner.

Chappuis Reflectors, Ltd.—Resolution for voluntary winding up passed at meeting held at 19 Manor Road North, Hinchley Wood, Esher, on Mar. 27. Mr. H. W. C. Bartlett, 76 Finsbury Pavement, E.C.2, appointed liquidator.

C.E.I. (Radio and Television), Ltd.—Mr. N. R. Oldaker, 133-136 High Holborn, W.C.1, appointed liquidator at meeting on Mar. 29.

Electel Radio Instrument Repair Co., Ltd.—Creditors to send particulars to liquidator, Mr. A. E. Cox, 59 Eversley Road, Sketty, Swansea, by May 3.

BANKRUPTCY ACTS

Receiving Orders

High Court of Justice.—H. J. A. Wade and C. L. Wade, residing and carrying on business as "C. and H. Wade and Co." at 40 Dulwich Road, Herne Hill, S.E.24, lately carrying on business at 68 Brixton Water Lane, Brixton, S.W.2. Receiving order filed on debtor's petition on Apr. 4.

First Meeting

Leeds.—J. F. Gannon, residing at 10 Deanswood Rise, Moortown, carrying on business at 11 Barclay Street, Leeds. First meeting on Apr. 19 at 3 p.m. at Official Receiver's Office, 29 East Parade, Leeds. Public examination on June 20 at 10.30 a.m. at The Court House, Albion Place, Leeds.

High Court of Justice.—Electro Plant, Ltd., of Cheapside Chambers, 23 Cheapside, Bradford. Creditors' and contributories' meetings at Official Receivers Office, Hallfield Chambers, 71 Manningham Lane, Bradford, on Apr. 20, at 11 and 11.30 a.m. respectively.

CONTRACTS PLACED

Durham E.C. Electrical installation at Jarrow Grammar School. G. F. Ellis and Co., £3,200.

Lamps. Supply of electric lamps to Metropolitan Water Board and Romford T.C. Thorn Electrical Industries Ltd.

L.C.C. Electric lighting and electric fire alarm systems at Banstead residential school: Johnson and Tanner, Ltd., £10,354; Read and Partners, Ltd., £10,615; Holliday and Son (Electrical), Ltd., £10,894; Thorpe and Thorpe, Ltd., £10,929; William Steward and Co., Ltd., £10,941; Samuel Reed and Sons, Ltd., £11,073; City Electrical Co., £11,238; Buchanan and Curwen, Ltd., £11,259; S.-E. E. Board, £11,830; George E. Taylor and Co. (London), Ltd., £11,916; Archibald Saville and Co., Ltd., £14,554.

Northampton T.C. Supply and erection of passenger lift at fire station. Express Lift Co. Ltd., £1,547.

B.E.A. During the past month, contracts placed for power station, switching and transforming station and transmission equipment amount in aggregate to £1,894,567.

Principal contracts: Plymouth "B" generating station: circulating water system, John Laing and Son, Ltd.; Connah's Quay generating station, Chester; reclamation works, Westminster Dredging Co., Ltd.; Usk Mouth generating station, Newport, Mon.: 132 kV overhead line extensions, Balfour Beatty and Co., Ltd.; Barking "C" generating station, 132 kV and auxiliary cables, Pirelli-General Cable Works, Ltd.; Ilford substation, 60 MVA 132/33 kV transformers and earthing transformers, English Electric Co., Ltd.

Dumfries substation: 132 kV 2,500 MVA switchgear, British Thomson-Houston Co., Ltd.; Oldbury substation, Worcs.: 45 MVA 132/33 kV transformers and earthing transformers, General Electric Co., Ltd.; Deptford substation: 60 MVA 132/66 kV transformers; Smethwick substation: 60 MVA 132/33 kV transformers and earthing transformers, and Capenhurst substation: 45 MVA 132/11 kV transformers and earthing transformers, Ferranti, Ltd.; Carrington-Altrincham-Sale, Cheshire: 132 kV overhead lines, Watsham's, Ltd.

TRADE NOTES

Change of Title.—The name of SILVERTOWN LUBRICANTS, LTD., has been changed to GULF OIL (Gt. Britain), LTD.

Change of Address.—TUSCAN INDUSTRIES, LTD., have moved to 100 Lough Road, Holloway Road, N.7. Telephone: North 2452/3.

BUSINESS PROSPECTS

HOME

Altrincham T.C. Construction of 60 houses on Broomwood estate. Borough Surveyor, Town Hall, Altrincham.

Ashby-de-la-Zouche R.D.C. Erection of 14 houses at Mersham and 20 houses at Newbold. Architect and Surveyor, V. G. Bolt, Council Offices, South St., Ashby-de-la-Zouche.

Atherton U.D.C. Erection of 46 dwellings on Hog Fold site. Architects, J. C. Prestwick and Sons, Bradshawgate Chambers, Leigh.

Congleton T.C. Erection of 30 houses on Parson St. housing site. Borough Engineer, C. Brown, Town Hall, Congleton.

Durham. Education Committee to spend £1,250 on installation of electricity at Hebburn Quay County School.

Edmonton T.C. Erection of block of 12 flats at Montagu Rd., Edmonton. Architect's Dept., Town Hall, Edmonton, N.9.

Guildford R.D.C. Erection of 32 dwellings at Tillingbourne Rd., Shalford. Engineer and Surveyor, Millmead House, Guildford.

Henley-on-Thames T.C. Improvements to 12 sub-standard hutments including electrical wiring. T. L. G. Jefferies, Borough Surveyor, Council Offices, Henley-on-Thames.

Hull. Erection of preliminary training school at Western General Hospital, Anlaby Rd., Hull, for Leeds Regional hospital board. Gelder and Kitchen, Architects, 120 Alfred Gelder St., Hull.

Kettering T.C. Erection of 96 houses at Stamford Rd. estate. J. Patrick Haugh, Borough Engineer and Surveyor, 3 Gold St., Kettering.

Leeds T.C. Erection of dwellings at Moortown and Seacroft estates. Contract 398 for 242 dwellings, Seacroft, Brooklands. Contracts 399-402 for 148 houses, Moortown. City Architect, Priestley House, Quarry Hill, Leeds 9.

Lincoln T.C. Erection of 8 shops, 5 flats and 8 maisonettes on Boultham Moor North estate. City Architect, Stamp End, Lincoln.

Liskeard T.C. Erection of 10 houses on Lanchard site. Higman and Ford, Architects, 2 The Parade, Liskeard.

Manchester T.C. Erection of 10 shops, 10 maisonettes and 10 garages at Portway, Wythenshawe. City Architect, Town Hall, Manchester.

Morley T.C. Erection of branch library at Wakefield Rd., Drighlington. E. V. Finnigan, Town Clerk, Town Hall, Morley.

Newcastle-upon-Tyne T.C. Erection of 158 houses on section D and 16 aged persons' dwellings on section B of Montagu housing estate. City Architect, 18 Cloth Market, Newcastle.

Northfleet U.D.C. Erection of 26 houses on Coldharbour Rd. estate. Engineer and Surveyor, Council Offices, Northfleet.

Norwich T.C. Erection of shop and flat at Cooper Lane estate and 23 garages at West Earlham estate. City Architect, City Hall, Norwich.

North Kesteven R.D.C. Erection of 38 houses in various parishes. J. Chadwick, 31 Clasketgate, Lincoln.

Ploughley R.D.C. Erection of 20 houses at Islip. J. W. Martin, Engineer and Surveyor, Waverley House, Bicester.

Ross and Cromarty C.C. Erection of additional classrooms at Muir of Ord Tarradale junior secondary school. County Architect, The Old Academy, Dingwall.

Salford T.C. Erection of two day nurseries at Bradshaw St., Salford 7, and Hayfield Terrace, Salford 6. City Engineer, Town Hall, Salford 3.

Staffordshire C.C. Erection of sub-sectional police station. T. H. Evans, Clerk, County Buildings, Stafford.

Swindon. Oxford Regional Hospital Board recommended to approve scheme for installation of bed lifts at St. Margaret's Hospital. Estimated cost £4,876.

Thorne R.D.C. Erection of 4 houses at Church Rd. and 4 at Oldfield Lane, Stainforth. Johnson and Crabtree, Architects, 20 Priory Place, Doncaster.

Welton R.D.C. Erection of 8 houses at Ingham and 2 at Snarford. Wm. Saunders and Partners, 24 Castle Gate, Newark-on-Trent.

Willesden. Middlesex C.C. recommended, subject to M.H. approval, to approve scheme for carrying out improvements to electric light installations at Dudden Hill school and Leopold Rd. school. Estimated costs £3,200 and £3,150 respectively.

Winchester T.C. Erection of 66 houses on Weeke housing estate. A. S. Wilson and Partners, Quantity Surveyors, 8 Princes St., Storey's Gate, Westminster, S.W.1.

West Riding C.C. All trades work for adaptation of "The Grove," Starbeck, near Harrogate. West Riding Architect, County Hall, Wakefield.

Worksop R.D.C. Erection of 28 houses at Harworth. Architect, B. D. Thompson, 83 Bridge St., Worksop.

OVERSEAS

Belgian Congo. A new aerodrome is to be erected at Leopoldville. Although no plans are yet available it is hoped to call for tenders at the end of this year or early 1951. Responsible authority is the Directeur General, Section Aeronautique, Gouvernement General, Leopoldville.

Brazil. Snr. Cassio Penteado, managing director Companhia Federal de Comercio, Industria e Engenharia, Rue Libero Bodaro 152 10^{10}, Sao Paulo, wishes to develop a connection with U.K. firm interested in exporting h.e. and water pumping equipment.

Malaya. Progress Advertising, P.O. Box 630, 70 Ampang Street, Kuala Lumpur, wish to contact U.K. manufacturers of illuminated wall signs.

Salt Lake City. W. H. Bintz Co., 433 West 3rd South, Salt Lake City, Utah, U.S.A. Interested in quotations for bakery, restaurant, hotel and dairy processing equipment.

Spain. Sr. Zugasti, President of Almacenes Mariano Zugasti, S.L., Hernan Cortes, 13 Madrid, is interested in manufacturing static condensers on royalty basis, and would welcome an agreement with U.K. manufacturers of these.

Winnipeg. Metal Mouldings, Ltd., 589 Clifton Street, Winnipeg, desire to represent U.K. manufacturers of water softeners and electrical appliances.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Brooks and Bohm (Electrical), Ltd., 90 Victoria St., S.W.1. Manufacturers of and dealers in lighting, heating, cooking and electrical equipment, etc. Cap.: £3,000. Dirs.: E. Etherington and Grace Etherington.

Horner (Maintenance) Services, Ltd., 506 Ulster Chambers, 168 Regent St., W.1. Manufacturers of and dealers in electric light and fluorescent lighting reflectors and signs, etc. Cap.: £1,000. Dirs.: N. G. Horner, T. Davis, D. C. L. Gratte and J. R. Milborrow.

International Combustion Africa, Ltd. British address, 53 New Broad St., E.C.2. Registered in South Africa in September, 1929, to carry on business of designers and manufacturers and contractors and constructional engineers for power plant of all kinds, etc. Cap.: £250,000. Name of persons authorised to accept service: Farrow, Bersey, Gain, Vincent and Co., Chartered Accountants, 53 New Broad St., E.C.2

W. T. Parker, Ltd., 113 Station St., Burton-on-Trent. Wireless, electric, lighting, telephone, mechanical and general engineers, etc. Cap.: £40,000. Dirs.: W. T. Parker, Mrs. F. A. Parker and D. W. Parker.

A. J. Record and Son, Ltd., Midland Bank Chambers, High St., Exeter. Wireless, elec. and television engineers, etc. Cap.: £10,000. Dirs.: A. J. Record and A. J. Record, jun.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Karryette.—B684,865. Class 9. Electric vacuum cleaners. C.V.A. Jigs, Moulds and Tools, Ltd., Portland Road, Hove.

Kenwell.—684,834. Class 9. Recording apparatus and instruments for recording and reproducing sounds. Small Pressure Die Castings (Bacup), Ltd., Lanehead Works, Bacup, Lancs.

Marco.—B684,030. Class 11. Refrigerators, refrigerating apparatus and installations. Marco Refrigerators Ltd., Manor Works, Rowan Road, London S.W.16.

MEETINGS TO NOTE

THURSDAY, APRIL 13

I.E.S. (Cardiff centre).—"Lighting of Steelworks," J. D. Callaway. S. Wales Electricity Board demonstration theatre, The Hayes, Cardiff.—5.45 p.m.

I.E.E. (Utilisation section).—Discussion. "B.S.I. Specifications in relation to Electrical Accessories for Domestic and Industrial Applications," J. F. Stanley. Institution, Savoy Place, W.C.2.—5.30 p.m.

E.P.E.A. (N. Meter and Instruments (Technical) group).—Annual General Meeting. "A simple outline of the factors influencing the stable operation of an electrical power system." A. H. Grey and D. R. Fenwick. Engineers' Club, Albert Square, Manchester.—6.30 p.m.

I.E.E. (Rugby students).—"Railway Signalling." R. Buglar. E.M.E.B. Show rooms, Rugby.—6.30 p.m.

FRIDAY, APRIL 14

Jnr. Instn. Engrs. (Ordinary meeting).—"The Induction Motor, with particular reference to single phase machines and some account of their developments," R. J. Herbert. 39 Victoria Street, S.W.1.—6.30 p.m.

I.E.E. (N.E. students).—"Calculating Machines," C. G. Hopper. Grey Hall, King's College, Newcastle-on-Tyne.—7 p.m.

SATURDAY, APRIL 15

I.E.E. (N. Midland students).—"Surge Phenomena in Power Engineering," A. W. Greenwood. Yorkshire Board Officer, Ferensway, Hull.—2.30 p.m.

MONDAY, APRIL 17

I.E.E. (informal meeting)—Discussion. "Private Generation and the Public Supply." A. N. Irens. Institution, Savoy Place, W.C.2.—5.30 p.m.

I.E.S. (Leeds centre).—Annual general meeting and presidential address. J. N. Aldington. Lighting Service Bureau, 24 Aire Street, Leeds 1.—6.30 p.m.

I.E.E. (N. Staffs sub-centre).—Annual general meeting. "The Economic Utilisation of Electricity in Great Britain." R. B. Giles. M.E.B. Showroom, Stoke-on-Trent.—7 p.m.

I.E.E. (Rugby sub-centre).—Annual general meeting. "Television with Practical Experiments." L. Herbert, Lecture Room, B.T.H. Co., Ltd., Rugby.—6.30 p.m.

I.E.E. (N. Eastern centre).—Annual general meeting. Royal Station Hotel, Newcastle-on-Tyne.—6.15 p.m.

Birmingham Elec. Club.—"A Layman Looks at Long Distance Transmission and its Possibilities." Lord Forrester, Grand Hotel, Birmingham.—6.30 p.m.

TUESDAY, APRIL 18

A.S.E.E. (London meeting).—"Electricity in Agriculture." C. A. Cameron Brown. Lighting Service Bureau, 2 Savoy Hill, W.C.2.

I.E.E. (N.W. centre).—"Technical Considerations Affecting the Development and Design of Electrical Control Gear for Machine Tools." A. R. H. Thorne. Engineers' Club, Albert Square, Manchester.—6.15 p.m.

I.E.E. (Measurement section).—Discussion. "Temperature Measurement." J. A. Hall, and C. R. Barker. Institution, Savoy Place, W.C.2.—5.30 p.m.

I.E.E. (Scottish centre).—Faraday lecture. "Radar". Dr. R. A. Smith. Large Examination Hall, Royal Technical College, Glasgow.—7 p.m.

I.E.E. (N. Midland centre).—"The Detection by Oscillographic Methods of Winding Failures During Impulse Tests on Transformers." E. C. Rippon and G. H. Hickling. Yorkshire Board Offices, 1 Whitehall Road, Leeds.—6.30 p.m.

WEDNESDAY, APRIL 19

I.E.E. (Southern centre).—"Electricity in the Cotton Industry." F. W. Cox and W. E. Swale. Grand Hotel, Bournemouth.—6.30 p.m.

A.S.E.E. (Manchester branch).—"Electric Vehicles." A. J. Bryan. Engineers' Club, Albert Square Manchester.—7.30 p.m.

THURSDAY, APRIL 20

I.E.E. (ordinary meeting).—41st Kelvin lecture. "Phase-Boundary Potentials and their Significance in Chemistry." Professor E. K. Rideac, Institution, Savoy Place, W.C.2.—5.30 p.m.

I.E.S. (Leicester centre).—"Black Light and its Applications." H. R. Ruff. Demonstration Theatre, E.M.E.B. Leicester sub-area, Charles Street, Leicester.—6.30 p.m.

I.E.E. (N. W. centre).—Faraday lecture. "Radar." Dr. R. A. Smith. Lit. and Phil. Lecture Theatre, Westgate Road, Newcastle-on-Tyne.

Brit. Instn. Radio Engrs. (London section).—"U.H.F. Propagation and Characteristics." D. W. Heightman. London School of Hygiene and Tropical Medicine Keppel Street, W.C.1.—6.30 p.m.

BY APPOINTMENT
ELECTRIC CABLE
MANUFACTURERS

Contractors:
Barlow & Young Ltd., Palace Street, S.W.1

Photographs by courtesy of University College

University College

LONDON CHEMISTRY DEPARTMENT

Re-wiring and modernising of the electricity distribution in this famous education centre in Bloomsbury has been carried out by Messrs. Barlow and Young, Ltd. to the specification of the consulting engineers, Messrs. Barlow Leslie & Partners, using Henley Rubber Cables exclusively, the installation including 662 lighting points and over 2,000 switch plugs.

Let Henley Cables carry the Current

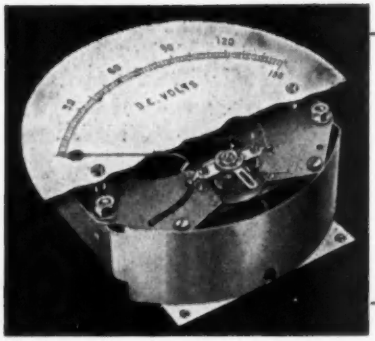
W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

FEATURES OF WESTON SUPERIORITY

Weston

MOVING COIL SWITCHBOARD INSTRUMENTS

Combining the sensitivity of a laboratory instrument with the robust qualities of a switchboard pattern, this new series of 'Weston' permanent-magnet, moving coil instruments represents a great advance in design and technique. They incorporate thermocouples and rectifiers where necessary. Special features include efficient damping, the new standard 'Weston' patented spring-loaded jewel to protect the pivot, magnetic shielding and a high degree of accuracy. Mounted in attractive bakelite cases, flush fitting or projecting, the 6" easily read scale is printed in black on white enamel. All instruments conform to B.S.I. Spec. No. 89. Special enquiries will receive the personal attention of our Technical experts. The model 857 illustrated is supplied as a D.C. Microammeter, Milliammeter, Millivoltmeter, Ammeter and Voltmeter, all with a variety of ranges.



MAGNETIC SHIELDING. To prevent interference from external magnetic fields and to reduce those due to the instrument, it is magnetically shielded as shown. The high degree of accuracy of these instruments is in no small measure due to this 'Weston' design.

SANGAMO WESTON LIMITED

ENFIELD, MIDDLESEX : Telephone: Enfield 3434 (6 lines) & 1242 (4 lines) Telegrams: Sanwest, Enfield.

DEPOTS AT GLASGOW, NEWCASTLE-ON-TYNE, MANCHESTER AND WOLVERHAMPTON.

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Skye and Lochalsh Area

CONTRACT NO. AC/S & L/6

22 KV, 11 KV, AND LOWER VOLTAGE DISTRIBUTION LINES

TENDERS are invited for the construction of approximately 250 miles of wood pole overhead distribution lines in the Island of Skye.

Tender documents can be obtained from the engineers, Messrs. Kennedy and Donkin, 12 Caxton Street, London S.W.1, on payment of a deposit of £2 2s., which will be refunded on receipt of a bona fide tender.

The latest date for application for tender documents is April 21, 1950. Tenders, in sealed covers, marked on outside, "Contract AC/S & L/6," must be returned to The Secretary, North of Scotland Hydro-Electric Board, 16 Rothesay Terrace, Edinburgh 3, to arrive not later than May 17, 1950.

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace, Edinburgh 3.
April 3, 1950. (E 348)

HITCHIN URBAN DISTRICT COUNCIL

Purwell Lane Housing Estate

ELECTRICAL INSTALLATIONS

THE Council invite tenders for the Electrical Installations for 28 houses on the Purwell Lane Estate, Hitchin.

Specification, plan, and form of tender may be obtained from the office of the Surveyor, Council Offices, Brand Street, Hitchin.

Tenders, in plain sealed envelopes endorsed "Electrical Installations," must be delivered to the undersigned not later than 12 noon on Monday, May 1, 1950.

The Council do not bind themselves to accept the lowest or any tender.

W. WILSON,
Clerk of the Council.

Council Offices, Brand Street,
Hitchin, Herts. (E 370)

BOROUGH OF REIGATE

ELECTRICAL REWIRING OF TOWN HALL

TENDERS are invited from electrical contractors who are accustomed to exterior conduit work in public buildings.

Form of tender, specification, general conditions and plan may be obtained from Mr. G. G. Sanderson, A.M.I.C.E. M.I.Mun.E., Borough Surveyor, Town Hall, Reigate, upon deposit of £2. This sum will be returned upon receipt of a bona-fide tender (which is not subsequently withdrawn) and the return of all documents. Cheques to be made payable to Reigate Corporation.

Tenders in plain sealed envelopes, bearing no mark or indication of the sender, and endorsed "Rewiring for Town Hall" must be received by me not later than Friday, 28 April, 1950.

The Council does not bind itself to accept the lowest or and tender.

HEBER DAVIES,
Town Clerk.

Town Hall, Reigate, Surrey.
March 29, 1950 (E 325)

COUNTY BOROUGH OF BELFAST

Electricity Department

TRANSFORMERS: FIRE FIGHTING EQUIPMENT

TENDERS are invited for the supply, delivery, and erection at the Harbour Power Station, Belfast, of (a) 33 kV and lower voltage transformers required in connection with power station extensions.

(b) CO_2 fire fighting equipment for the protection of 33 kV and lower voltage switchgear.

Forms of tender, conditions, specifications and drawings (in quadruplicate) may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas in respect of each of items (a) and (b) (cheques to be made payable to the Belfast Corporation Electricity Department), which deposits will be refunded provided bona fide tenders be lodged and not withdrawn. Extra copies of the contract documents may be obtained at three guineas per set per item, which sum will not be returnable.

Each Tender, in quadruplicate, in sealed envelope marked "Tender for ....., Harbour Power Station" and endorsed with the name and address of the tenderer, must reach the undersigned not later that 4 p.m., on Friday, May 12, 1950.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast,
April 6, 1950. (E 369)

APPOINTMENTS VACANT

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following vacancies in the department of the Sub-Area Engineer in Nos. 4 and 5 Sub-Areas:—

(1) ENGINEERING DRAUGHTSMAN, Sub-Area Headquarters, Electricity House, Rhostyllen, Wrexham, at a salary within the range of £450-£550 per annum, according to qualifications and experience.

Applicants should have had experience in an engineering drawing office and should possess the Ordinary National Certificate in Engineering.

(2) RECORDS DRAUGHTSMEN, Sub-Area Headquarters, Electricity House, Rhostyllen, Wrexham, and District Offices at Legacy, Caernarvon and Towyn, and also in the Construction Departments at Rhuddlan and Welshpool, at salaries within the range of £300-£400 per annum, according to qualifications and experience.

Applicants should have had some general experience in a drawing office of the preparation of drawings and schedules and be able to prepare from information obtained directly on site, map records of overhead lines and underground cables and records of sub-station layouts.

The salary ranges quoted are provisional and subject to such variations as may be necessary to conform with the scales of salaries agreed after negotiations with the appropriate staff organisation.

The successful candidates may be required to undergo medical examinations and, if eligible, to contribute to a superannuation scheme.

Applications, on form obtainable from the Manager, No. 4 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Rhostyllen, should be completed and returned to him so as to be received not later than Friday, April 28, 1950.

J. RANKIN,
Secretary.
(E 363)

NORTH WESTERN ELECTRICITY BOARD

No. 7 Sub-Area

APPOINTMENT OF SENIOR ASSISTANT TO DISTRICT ENGINEER
NEW MILLS DISTRICT

APPLICATIONS are invited for the position of Senior Assistant to District Engineer in the New Mills District of the No. 7 Sub-Area, at a salary in accordance with the revised schedule of the National Joint Board, Class "D," Grade 5, i.e. £641-£648-£655 per annum. The post is superannuable.

The engineer appointed will be required to assist the district engineer in all work in connection with district organisation, which covers construction work on high and low voltage services and extensions, the operation and maintenance of high and low voltage distribution systems within the district, both overhead and underground; the operation and maintenance of substation plant, the location of faults in underground cables and the preparation of estimates and reports in connection with the work required under the district organisation.

Preference will be given to applicants who are corporate members or graduates of the Institution of Electrical Engineers or who hold exempting qualifications.

Applications, stating age, education, qualifications and experience, present position and salary, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, not later than Saturday, April 29, 1950. (E 372)

LONDON ELECTRICITY BOARD

DRAUGHTSMEN—CHIEF ENGINEER'S DEPARTMENT

APPLICATIONS are invited for posts in the Drawing Office of the Engineering Department at Head Office in Central London.

Draughtsmen are required for positions associated with the work of laying e.h.v. underground cables.

Applicants should have had good experience in making surveys of cable routes, taking records on site during the laying of cables, and producing final record drawings.

The commencing salary will be from £400 per annum for those with the necessary experience, and for the junior posts the salary will be dependent upon qualifications.

Application forms obtainable by sending addressed foolscap envelope to Establishments Officer, 46-47 New Broad Street, E.C.2, returnable not later than April 24, 1950. Please quote EST/V.721T on envelope and all correspondence. (E 355)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:—

(a) OPERATION AND MAINTENANCE ENGINEER, Weston District (headquarters, Weston-super-Mare). Commencing salary, £579 p.a. (Class "E," Grade 7, new N.J.B. Schedule).

(b) OPERATION AND MAINTENANCE ENGINEER, West Devon District (headquarters, Bideford). Commencing salary, £531 p.a. (Class "C," Grade 7, new N.J.B. Schedule).

(c) OPERATION AND MAINTENANCE ENGINEER, Exeter District (headquarters, Exeter). Commencing salary, £579 p.a. (Class "E," Grade 7, new N.J.B. Schedule).

(d) OPERATION AND MAINTENANCE ENGINEER, Bridgwater District (headquarters, Bridgwater). Commencing salary, £563 p.a. (Class "D," Grade 7, new N.J.B. Schedule).

Applicants should be thoroughly familiar with the operation and maintenance of urban and rural supply networks up to 11 kV u.g and 33 kV o/h, including substation equipment, protective gear, fault localisation, and safety regulations and be accustomed to the control of men.

(e) ASSISTANT CONSTRUCTION ENGINEER (o/h), Weston District (headquarters, Weston-super-Mare). Commencing salary, £519 p.a. (Class "E," Grade 9, new N.J.B. Schedule).

Applicants should be experienced in o/h line planning and construction, including the scheduling and requisitioning of materials, preparation of notices and plans, and control of labour in the field. Qualifications leading to corporate membership of the I.E.E. will be an advantage.

(f) DRAUGHTSMAN AND SURVEYOR, Weston District (headquarters, Weston-super-Mare). Provisional salary, £450-£500 p.a.

Applicants should have had general experience in a mains drawing office and be competent to undertake all surveying work for the distribution system in the district, including preparation of profiles and quantity schedules.

The salaries for all these posts are subject to confirmation.

Detailed applications, stating age, qualifications and experience, present appointment, and salary, to be submitted to Assistant Secretary (Establishments), South Western Electricity Board, Electricity House, Colston Avenue, Bristol 1, within 10 days. (E 356)

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY

City and Guilds College

ASSISTANT LECTURER required in electrical engineering department, with special interest and preferably industrial experience in high-voltage work. Honours degree essential. Salary £450 p.a., with federated superannuation. Commencing date, October 1, 1950.—Applications, with full details of qualifications, to Head of Electrical Engineering Department, City and Guilds College, Exhibition Road, London S.W.7. (E 364)

NORTH WESTERN ELECTRICITY BOARD

No. 2 Sub-Area

APPOINTMENTS—SUB-AREA CONSUMERS' ENGINEER'S DEPARTMENT

APPLICATIONS are invited for the following appointments in the Sub-Area Consumers' Engineer's Department, No. 2 Sub-Area Headquarters, Bolton.

1. ASSISTANT TO SECTION HEAD—POWER SALES.

Applicants should have experience in the utilisation of electricity in industry with particular reference to the textile, colliery, engineering and chemical trades, the economics of private generating plant, and changeover from d.c. to a.c.

Corporate membership of the Institution of Electrical Engineers will be an advantage.

Salary will be in accordance with the National Joint Board Schedule, Class "L," Grade 7, i.e. £841-£861-£881 per annum.

2. ASSISTANT POWER SALES ENGINEERS.

The successful candidates will be responsible to the Sub-Area Industrial Development Engineer, and should have experience in power sales work in connection with the following:—

i. The utilisation of electricity for all industrial requirements with particular reference to textiles.

ii. The utilisation of electricity for all industrial requirements with particular reference to collieries.

Experience of changeover work from d.c. to a.c., the economics of private generating plant, and street lighting, would be an advantage.

The salaries will be in accordance with the National Joint Board Schedule, Class "L," Grade 10, i.e. £687-£700-£713 per annum.

Technical training up to Higher National Certificate standard will be an advantage.

3. SENIOR ASSISTANT TO THE SUB-AREA DOMESTIC AND COMMERCIAL SALES AND DEVELOPMENT ENGINEER.

Applicants should have experience in connection with the following:—

Domestic and commercial sales including hire and hire purchase.
Domestic and commercial sales development.
Agricultural and horticultural applications of electricity.
Organisation of exhibitions and demonstrations.
Publicity and display.
Supervision of service centres.

The salary will be in accordance with the National Joint Board Schedule Class "L," Grade 7, i.e. £841-£861-£881 per annum.

4. ASSISTANT TO THE SUB-AREA SALES SUPERINTENDENT.

Applicants should have experience of the supervision of service centres, organisation of exhibitions and demonstrations, and display.

Salary will be in accordance with the National Joint Board Schedule, Class "L," Grade 13, i.e. £547-£561-£575 per annum.

5. AGRICULTURAL DEVELOPMENT ENGINEER.

Applicants should have experience in all applications of electricity to farming, horticulture and poultry farming, and be able to advise on plant and equipment for these requirements. Some theoretical knowledge of agriculture is desirable, and ability to give lectures would be an advantage.

Salary will be in accordance with the National Joint Board Schedule, Class "L," Grade 13, i.e. £547-£561-£575 per annum.

6. ASSISTANT INSTALLATIONS ENGINEERS (CONTRACTS).

Applicants should have experience in the supervision of the installation of wiring, switchgear, motors, plant and lighting in industrial and commercial premises and public buildings.

The salaries will be in accordance with the National Joint Board Schedule, Class "L," Grade 13, i.e. £547-£561 £575 per annum.

Applications, stating age, qualifications and experience, present position and salary, and the appointment for which application is made, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, not later than Saturday, April 29, 1950. (E 367)

NORTH WESTERN ELECTRICITY BOARD

No. 5 Sub-Area

APPOINTMENT OF DISTRICT ENGINEER

APPLICATIONS are invited for the appointment of District Engineer in the Rossendale District of the No. 5 Sub-Area.

Candidates should have had a sound training in electrical engineering and considerable experience in the operation and maintenance of high- and low-voltage networks (overhead and underground) and sub-stations, the supervision of constructional work, and the keeping of essential records of mains and sub-station equipment and layouts. The successful applicant will be responsible for the general maintenance of supply in the district.

The salary will be in accordance with the National Joint Board Schedule, Class "E," Grade 3, i.e., £775-£792-£809 per annum.

Corporate membership of the Institution of Electrical Engineers will be an advantage.

Applications, stating age, education, qualifications and experience, present position and salary, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, not later than Saturday, April 29, 1950. (E 366)

LONDON TRANSPORT EXECUTIVE

APPLICATIONS are invited for the post of HIGH TENSION MAINS ASSISTANT in the office of the Electrical Engineer. The salary range will be £550 by £20 to £610 per annum. Applicants should have had theoretical training and practical experience in the installation, maintenance, testing and fault location of 11 kV and 22kV power cables and l.t. multicore control cables. A recognised engineering qualification would be an advantage, and it is desired that the successful applicant should reside within easy reach of the executive's railway system.

The appointment is subject to a medical examination. On completion of a satisfactory probationary period, the selected applicant would, where eligible, be expected to join a contributory superannuation scheme. Canvassing, either directly or indirectly, will disqualify.

Applications, giving full details of age, training and experience, should be sent within 14 days of the appearance of this advertisement to the Staff Officer (F/EV 124), London Transport Executive, 55 Broadway, Westminster, S.W.1.

For acknowledgment, enclose addressed envelope.

March 28, 1950. (E 361)

LONDON TRANSPORT EXECUTIVE

APPLICATIONS are invited for the post of TEMPORARY DRAUGHTSMAN in the Plant Section of the Office of the Works Manager (Buses and Coaches), Chiswick Works. The duties will concern design and layout work in connection with electrical equipment and services for works. Applicants must have practical experience in factory electrical work, and must have the ability to design power and lighting installations. Drawing office experience is essential. Possession of the National Certificate or comparable qualification would be an advantage.

Commencing salary will be according to age and experience up to £420 per annum, with additional payments for certain recognised qualifications.

The appointment is subject to a medical examination. Canvassing, directly or indirectly, will disqualify.

Applications, giving full particulars of age, experience and qualifications, should be sent within 14 days of appearance of this advertisement to the Staff Officer (F/EV 125), London Transport Executive, 55 Broadway, Westminster, S.W.1. For acknowledgment, enclose addressed envelope.

March 24, 1950. (E 362)

NORTH WESTERN ELECTRICITY BOARD

Area Board Headquarters

APPOINTMENT OF AGRICULTURAL DEVELOPMENT ASSISTANT, CHIEF COMMERCIAL OFFICER'S DEPARTMENT

APPLICATIONS are invited for the appointment of Agricultural Development Assistant to operate from the Board's Headquarters in Manchester.

Applicants should have a wide knowledge of the applications of electricity in agriculture and horticulture and should be qualified to give lectures to meetings of farmers, growers, etc.

The salary offered is £750 per annum, and is provisional and subject to negotiation pending the adoption of national scales.

Applications, stating age, technical qualifications, training, experience, present position and salary, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, not later than Saturday, April 29, 1950. (E 365)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following post:—STATION SUPERINTENDENT, Rye House Generating Station, Hoddesdon, Herts.

The station is now under construction and the appointment will carry the classification of Class "G," Grade 1, in accordance with the present programmed plant capacity, the commencing salary being £1,089 per annum.

The successful applicant will be responsible for the efficient local management and operation of the station. Applicants should have received a thorough technical and practical training, followed by a career giving wide experience in the operation and maintenance of generating station plant, and also must have held a position of responsibility, involving the control of technical, operating and administrative staffs. The successful applicant will be expected to reside within a reasonable travelling distance of the generating station.

The salary and conditions of service will be in accordance with the N.J.B. Agreement and the appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be made on forms of application obtained from the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to whom completed forms should be sent to arrive not later than the 21st April, 1950.

W. N. C. CLINCH,
Controller.

Northmet House, Southgate, N.14. (E 326)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following post in the Generation Construction Department at Divisional Headquarters in North London:—

ASSISTANT ENGINEER (Mechanical). Applicants should preferably have attained degree standard and served a recognised workshop apprenticeship. They should have had experience with mechanical plant associated with modern generating stations.

Salary according to qualifications and experience within the range £606-£699 p.a., plus 5 per cent. London weighting in accordance with the N.J.B. Schedule dated April 1, 1948, Grade 7-5, Class "J."

The salary is in accordance with the scale at present operating, but will be subject to negotiation through the medium of the Joint Board.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Applications, stating age, experience and present position, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than April 28, 1950. Envelopes should be endorsed "Assistant Engineer (Mechanical), Generation Construction Department."

W. N. C. CLINCH,
Controller.

Northmet House, Southgate, N.14. (E 359)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the position of GROUP CHEMIST in the Generation (Operation) Department. This grade is provisional and is subject to determination by the appropriate organisations.

Applicants, who must not be more than 45 years of age (unless already in the service of the B.E.A.), should hold a university degree in chemistry and/or be a corporate member of the Royal Institute of Chemistry, must have had a considerable experience in the analysis and behaviour of fuels, oils, and waters, associated with high-pressure and high-temperature steam generating plant and turbines, and knowledge and experience in recent research and practice associated with corrosion and bonded deposits, metallurgy and metallography relating to metals and alloys used for high-temperature steam plant.

The person appointed will be located at Staythorpe Generating Station, near Newark, and in addition to Staythorpe, will be responsible for the supervision of the laboratory personnel at the other stations in the Northern Group of the Division.

Salary will be £707 per annum, which is to be regarded as provisional until the final scales have been negotiated with the appropriate organisations. The successful candidate will be required to pass a medical examination and superannuation will be under terms and conditions approved by the British Electricity Authority.

Applications should be submitted on the appropriate application form, which may be obtained from the Divisional Establishments Officer, British Electricity House, Barker Gate, Nottingham, and should be returned not later than April 24, 1950.

W. S. BURGE,
Divisional Controller.

30.3.50. (E 329)

BRITISH ELECTRICITY AUTHORITY

London Division

GROVE ROAD GENERATING STATION

APPLICATIONS are invited for the position of BOILER HOUSE ENGINEER in charge of boiler house shift operation.

Applicants should have received a sound engineering training and have had practical experience in the operation of boiler plant. They should also have received a sound technical training and have obtained the National or Higher National Certificate in Electrical or Mechanical Engineering, or their equivalent.

Salary to be in accordance with the revised N.J.B. Schedule, Grade 9, Class "F."

The appointment will be subject to membership of the British Electricity Authority and Area Board's Superannuation Scheme.

Applications, stating age, qualifications and experience, should be addressed to the Acting Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within 14 days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(E 360)

LONDON ELECTRICITY BOARD

ENGINEER (CONSTRUCTION)

APPLICATIONS are invited for the above position in the Construction Branch of the Southern Sub-Area.

Applicants should be corporate members of the Institution of Electrical Engineers and possess a general experience of construction of sub-stations and h.t. and m.p. cable systems, both by contract and direct labour; experience in costing and supervision in connection therewith is essential.

The commencing salary will be £750 per annum, pending grading of the post under the revised agreement of the National Joint Board.

Application forms, obtainable by sending addressed foolscap envelope to Establishments Officer, 46-47 New Broad Street, E.C.2, returnable by April 24, 1950. Please quote EST.V/642.T on envelope and all correspondence.
(E 374)

CROWN AGENTS FOR THE COLONIES

COMBUSTION ENGINEER required by the Nigerian Government Electricity undertakings for two tours of 18 to 24 months each with prospect of permanency. Commencing salary according to age and experience in scale £720, rising to £1,300 a year, including expatriation pay. Outfit allowance. Liberal leave on full salary. Free passages. Candidates, under 45 years of age, should be either A.M.I.Mech.E., or M.Inst.Fuel, with a knowledge of combustion science as applied to steam raising plant, ability to operate same and to carry out boiler trials. Experience of gas producing plant an advantage.

Apply, at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M.N 25047/3B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (E 375)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment :—

SHIFT CHARGE ENGINEER—Letchworth Generating Station.

Salary in accordance with the revised N.J.B. Schedule, Grade 7, Class "D" (£563-£573 per annum).

Applicants should have served an apprenticeship and obtained an ordinary National Certificate in electrical and/or mechanical engineering or equivalent and possess experience in the operation of power stations.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Applications, stating age, experience and present position, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than April 28, 1950. Envelopes should be endorsed "Shift Charge Engineer, Letchworth."

W. N. C. CLINCH,
Controller.
Northmet House, Southgate, N.14. (E 371)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions in the Bristol Sub-Area:

(a) DISTRICT COMMERCIAL OFFICER, Bath District (headquarters, Bath). Commencing salary, £722 p.a. (Class "E," Grade 4, new N.J.B. Schedule).

(b) DISTRICT COMMERCIAL OFFICER, Weston District (headquarters, Weston-super-Mare). Commencing salary, £722 p.a. (Class "E," Grade 4).

The successful applicants will be responsible for the general commercial activities of the district, including the preparation of technical schemes and estimates and participation in negotiations for the supply of electricity to industrial premises. Their detailed responsibilities will include negotiation with consumers, load building, installation contracting, control of Service Centre displays and demonstrations, exhibitions and preparation of statistical data and reports. Corporate membership of the I.E.E. is desirable.

(c) ASSISTANT DISTRICT COMMERCIAL OFFICER, Weston District (headquarters, Weston-super-Mare). Commencing salary, £627 p.a. (Class "E," Grade 6, new N.J.B. Schedule). Candidates should have a sound knowledge of installation and contracting work, I.E.E. and factory regulations, and be capable of advising consumers on tariffs and costs. Corporate membership of the I.E.E. will be an advantage.

(d) SENIOR CLERK—RECHARGEABLE ACCOUNTS, Bristol Sub-Area (headquarters, Bristol). Provisional salary within range £450-£525 p.a. Candidates must have a sound knowledge of electrical contracting and of costing and invoicing rechargeable work. Ability to deal with queries and correspondence and to organise and control staff is essential.

Detailed applications, stating present appointment, and salary, age, qualifications, and experience, to be submitted to Assistant Secretary (Establishments), South Western Electricity Board, Electricity House, Colston Avenue, Bristol 1, within 10 days. (E 357)

NORTH WESTERN ELECTRICITY BOARD

No. 5 Sub-Area

ASSISTANT TO DISTRICT CONSUMERS' ENGINEER

APPLICATIONS are invited for the post of Assistant to District Consumers' Engineer in the Rossendale District of the No. 5 Sub-Area.

The salary, which is provisional and subject to negotiation with the appropriate body, will be in accordance with the National Joint Board Schedule, Class "E," Grade 8, i.e., £550-£555-£560 per annum.

Applicants should be experienced in the negotiation of all classes of sales and load development, lecturing, exhibition and demonstration work, records systems, and supervision of showrooms and of staff.

Applications, stating age, qualifications, and experience, present position and salary, should be received by R. H. Harral, Esq., M.I.E.E., M.Inst.F., No. 5 Sub-Area Manager, The North Western Electricity Board, Jubilee Street, Blackburn, not later than Saturday, April 29, 1950. (E 373)

ELECTRICAL FOREMEN

THE STEEL COMPANY OF WALES, LTD., have a number of vacancies for Electrical Foremen (maintenance) at their Abbey, Margam, and Port Talbot Works.

Apprenticeship and experience on maintenance of heavy industrial plant (preferably steelworks) is essential.

Applications, giving full particulars of training and experience, should be addressed to The Superintendent (Labour and Wages), The Steel Company of Wales, Ltd., P.O. Box No. 9, Port Talbot, Glam. (E 378)

ARMATURE WINDER (FOREMAN) wanted for small shop, N.E. Scotland. Good pay and conditions to right man.—Box No. 1185, Electrical Times. (E 384)

CHARGE ENGINEERS

POWER STATION CHARGE ENGINEERS urgently required by major oil company for service in the Middle East. Must hold at least Higher National Certificate in Electrical Engineering and have had not less than three years' experience in the operation of large modern steam power stations with thorough knowledge of the routine operation of water-tube boilers, turbo-alternators, E.H.T. switchgear and auxiliary plant. Present position in this country should be not less than Grade 8a, Class "H" or Grade 6, Class "G" on N.J.B. Scale. Age not over 33 years. Married accommodation available. Commencing salary not less than £900 per annum, plus generous allowance in local currency. Free passages out and home; free medical attention, kit allowance, good leave arrangements. Pension scheme.

Write, giving age, personal particulars, and full details of qualifications and experience, quoting Dept. F.189 to

Box 2550, at 191 Gresham House, E.C.2. (E 284p)

A DESIGNER/DRAUGHTSMAN required by manufacturers of "Temco" Domestic Electrical Accessories. Must be familiar with the light electrical apparatus industry.—Write, giving full details of experience and salary required to Personnel Manager, Telephone Manufacturing Co., Ltd., Martell Road, West Dulwich, S.E.21. (E 247)

CHIEF ENGINEER required by well-known electrical manufacturer in the Midlands to take charge of F.H.P. Motor Division. Applicants should be experienced in all branches of small lightweight a.c. and d.c. motors and generators.—Write, in confidence, giving full details of previous experience, to: Box No. 1173, Electrical Times. (E 347)

DESIGNER DRAUGHTSMAN for contactor control gear, mainly d.c. Higher National Certificate or equivalent, required by north-east coast engineering company.—Reply, stating age, experience and salary required, to Secretary, Box No. 1151, Electrical Times. (E 293)

DESIGNER DRAUGHTSMAN required for the engineering laboratory of a large light engineering firm in the West London area for development work. Should have a knowledge and experience of tool design.—Apply, giving details of age and experience to Box No. 1141, Electrical Times. (E 288)

ELECTRICAL DESIGNER for d.c. and a.c. machinery up to 500 kW. Higher National Diploma or equivalent, required by north-east coast engineering company.—Reply, stating age, experience and salary required to Secretary, Box No. 1153, Electrical Times. (E 294)

ELECTRICAL INSPECTORS required by major oil company operating in Middle East. Applicants should have a wide experience of inspection and testing of motors, switchgear, and the electrical equipment associated with modern large generating stations, substations, and transmission and distribution networks with voltage ranges of 33 kV to 440 V. Knowledge of flameproof equipment an advantage. Possession of Higher National Certificate essential and qualifications up to A.M.I.E.E. desirable. Age limit 37 years. Attractive salary, plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, pension scheme, good leave arrangements.—Write, stating age and full details of qualifications and experience, quoting Dept. F.182, to Box 2333 at 191 Gresham House, E.C.2. (C 304)

ESTIMATING ENGINEER installation work, must have actual experience contractor's office. Excellent prospects for good man.—Write experience (chronologically) and salary required: Alliance Electrical Co., Ltd., 2 Henrietta Street, London W.C.2. (E 285)

ENGINEER DRAUGHTSMAN with experience in design, layout and installation of complete electrical equipment for gas and chemical plants required by firm of engineers and contractors.—Apply, stating age, experience and salary required, to: Box No. 1179, Electrical Times. (E 381)

FERRANTI LIMITED have staff vacancies for Engineers in their Power Engineering Department as follows:

Reference T.W. Various positions in an ASSISTANT capacity in WORKS MANAGEMENT. Young men are required with practical experience and preferably academic qualifications and keen on the manufacturing side.

Reference T.M. WORKS METHODS AND PROCESS DEVELOPMENT ENGINEERS. Men are required with experience of production methods and techniques to deal with all aspects of modern power transformer manufacture.

Reference T.R. ELECTRICAL AND MECHANICAL ENGINEERS for Development and Research Work on power transformers and ancillary equipment. Men are required with academic qualifications and preferably with subsequent experience in this or a similar field.

Reference T.D. ELECTRICAL ENGINEERS for Design Work on power transformers. Men are required with academic qualifications and preferably with subsequent engineering experience.

Reference T.E. ESTIMATING ENGINEERS. Men are required with experience of, or interested in training for, estimating positions in Power Transformer Work.

Reference T.D.O. DESIGNING DRAUGHTSMEN, preferably with experience on Transformers.

Progressive salaries are paid which are generally in alignment with the Scientific Civil Service rates with allowances for ability, experience and qualifications.

The Company has a Staff Pension Scheme.

Application forms from the Staff Manager, Ferranti Limited, Hollinwood, Lancs.

Please quote reference of appropriate vacancy. (E 226)

FOREMAN SUPERINTENDENT required for large coil-winding shop manufacturing a big variety of coils. Applicants must be thoroughly conversant with all aspects of winding and finishing and in addition, accustomed to handling both male and female labour. Good salary will be paid to one able to get output with quality. House will be provided.—Box No. 1169, Electrical Times. (E 329)

JUNIOR DRAUGHTSMAN required for detail and assembly drawing, modifications and schedule preparation for manufacturers of electro-mechanical devices in West London area.—Write full details of experience and salary required to Box No. 1149, Electrical Times. (E 292)

FITTERS AND WINDERS experienced in large repair shop practice, wanted urgently. —Apply, in person or writing, Dowding and Mills, Ltd., Camp Hill, Bordesley, Birmingham 12. (E 344p)

JUNIOR DESIGNER DRAUGHTSMAN required for the engineering laboratory of a large light engineering firm in the West London area. Should be between 20 and 25 years of age, experienced in domestic appliance design and preferably with mechanical training.—Apply, giving details of age and experience to Box No. 1143, Electrical Times. (E 289)

JUNIOR DRAUGHTSMEN required with experience in quantity production of telecommunication equipment or small electrical apparatus. These vacancies carry good salaries and offer scope for advancement to selected applicants.—Apply, in writing, giving details of experience, to Personnel Manager, Telephone Manufacturing Co., Ltd., Martell Road, West Dulwich, London S.E.21. (E 299)

REPRESENTATIVE required for the Lancashire area with prospects of appointment as Area Manager. Good salary plus expenses. Knowledge of industrial lighting equipment an advantage. Write, stating age and experience, which will be treated in confidence.—Box No. 1187, Electrical Times. (E 386)

REQUIRED by Jas. Williamson and Son, Limited, Lancaster: INSTRUMENT FITTER, SHIFT ELECTRICIAN.—Apply: Personnel Dept., Lune Mills. (E 379)

REVO ELECTRIC CO., LTD., require ADDITIONAL SALES REPRESENTATIVES for the London area. Applicants should be 30-35 years of age, have good electrical background, should be resident in this area, and possession of a car would be an advantage. Only men of proved ability considered.—Applications should be made, giving full details of experience, salary required, etc., in confidence, to Sales Director, 30 Great Queen Street, London W.C.2. (E 322)

SALES REPRESENTATIVES (4): (a) Yorkshire; (b) Midlands; (c) South Wales; (d) South Coast, for well-known Electric Light Fittings Manufacturers. Progressive position for keen and energetic men with proved qualifications and connections.—Applications, stating age, experience, etc., will be treated in strict confidence, and should be addressed to Micramatic Ltd., Wootton Mount, Old Christchurch Road, Bournemouth. (E 368)

SENIOR DRAUGHTSMAN required with experience in design of telecommunication equipment or small electrical apparatus for quantity production. Good salaries to selected applicants and the positions offer good prospects for advancement.—Apply, in writing, giving fullest possible details of experience, to Personnel Manager, Telephone Manufacturing Co., Ltd., Martell Road, West Dulwich, London S.E.21. (E 300)

SENIOR DRAUGHTSMEN required, with experience in design of manual or trunk telephone equipment and apparatus. These vacancies carry good salaries and offer scope for advancement.—Write, giving full details of experience, to Personnel Manager, Telephone Manufacturing Co., Ltd., Martell Road, West Dulwich, S.E.21. (E 298)

TECHNICAL ASSISTANT for interesting work in small laboratory engaged in development of mass-produced electrical switchgear and control devices in modern West London factory. Minimum qualifications, Ordinary National. Laboratory experience essential.—Box No. 1161, Electrical Times. (E 310)

TELEPHONE MECHANIC. A vacancy exists at a large works in Neath district for a Telephone Maintenance Mechanic, experienced in the maintenance of Strowger type automatic exchange apparatus and associated equipment. He must be capable of locating and repairing faults on overhead lines and multicore telephone cables and on subscribers' apparatus.—Apply, Box No. 1131 Electrical Times, stating experience, etc. (E 259)

THE FORD MOTOR COMPANY require to fill the appointment of SHIFT CHARGE ENGINEER in their power house. Present capacity equivalent to 70,000 kW. Candidates must have a sound technical training and be experienced in all branches of engineering associated with the design and operation of high-pressure boiler and turbine plant. They should be in possession of technical qualifications admitting to corporate membership of a recognised professional institute. Salary £750 p.a. The post is permanent and pensionable. Applicants should reply very fully to Labour Relations Division, Ford Motor Company, Dagenham, quoting reference E.JKH.CE. Those who replied to our previous advertisement for Assistant Shift Engineer or Assistant Mechanical Maintenance Engineer need not re-apply for this post. (E 332)

SENIOR DRAUGHTSMAN for detailing L.T. metalclad switchgear, modern factory conditions, 5-day week, good rates, and assistance in obtaining accommodation.—G. P. Dennis, Ltd., Fleming Road, Speke, Liverpool 19. (E 232)

TRANSFORMER TEST FOREMAN required by Midland firm. Experience of power transformers up to 30 MVA and voltages up to 132 kV, on-load gear, etc., essential.—Details of experience, salary, age, etc., to Box No. 1109, Electrical Times. (E 231)

TWO AREA SALES MANAGERS required by makers of first-class medical ray lamps, living in B.E.A. Board Areas of (a) East Midlands, and (b) Southern. Selected men will have proved sales ability and energy, and will be closely supported by our sales office and advertising. At least £1,000 each to be earned in salary, expenses, and commission.—For interview, write fully of past and present work to Box No. 1155, Electrical Times. (E 307)

WELL-KNOWN Transformer Manufacturers in the South require live TECHNICAL AGENT in Scotland to promote sales of h.t. distribution transformers, mining transformers and industrial transformers throughout Scotland.—Reply, Box No. 1181, Electrical Times. (E 382)

YOUNG ENGINEERS wanted for Contracts and Sales Department of electrical manufacturers near London. Keen, energetic men, age approximately 25 years required. Positions have prospects of outside sales engineering later —State age, experience and salary required to: Box No. 1183, Electrical Times. (E 383)

YOUNG MAN who has completed his military training required to assist with CLERICAL SALES WORK of a technical nature. Knowledge of electrical machines an advantage.—Write, giving full details to the Sales Manager, Powell Duffryn Carbon Products, Ltd., Springfield Road, Hayes, Middlesex. (E 356)

APPOINTMENTS WANTED

CORPORATE MEMBER, I.E.E., age 36, 18 years in supply industry. Present position district engineer, salary £800 p.a., requires job with outlet for individual effort either in ELECTRICAL ENGINEERING or otherwise. Will undertake secretarial or any other qualifications that may be advantageous.—Box No. 1133, Electrical Times. (E 260)

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A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines). Service Electric Co. Ltd., Stanmore, Middx. (D 324)

ARMATURE ROTOR AND STATOR WINDING. We specialise in the repair and rewind of all types of electrical machines from fractional h.p. upwards. Special departments for vacuum cleaners, dryers, portable tools, etc. All work fully guaranteed.—Walter Crane, Greencoat Electrical Works, Westgate, Wakefield. Telephone 2172. (A 4)

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Box No. 1171, Electrical Times.

(E 345p)

A.C./D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Phone: Chiswick 5106. (A 20)

SCRAP ACCUMULATOR PLATES and Sediment wanted, any quantities. Also Storage Batteries purchased and dismantled.—Phone or write Elton Levy Co., Ltd., St. Ermin's (West Side), Caxton Street, London S.W. Phone: WHitehall 9621/2/3. (A 3)

WANTED.—D.C. and a.c. ball-bearing MOTORS.—Full details to Britannia Manufacturing Co., Ltd., 22/26 Britannia Walk, London N.1. (A 13)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady St., Bethnal Green, E.1. (A 1)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED.—Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath. (A 5)

WANTED, 2.75 kVA Coventry Climax Petrol Alternator Sets, unused.—Box No. 1167, Electrical Times. (E 328)

WANTED, 6,600/415 VOLT TRANSFORMERS. Two or three Transformers of 500 kVA to 1,000 kVA each are required immediately. H.V. windings 6,600 V, l.v. windings 400-440 V 3 ph, 50 c/s. Please send full particulars to the Divisional Controller, British Electricity Authority, Ergon House, Horseferry Road, Westminster, S.W.1. (E 327)

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MANUFACTURERS' AGENTS ASSOCIATION, INC. (E.T.), 6 Bream's Buildings, London W.C.2, supplies free lists of Agents to Manufacturers seeking representation in important industrial centres. Membership available to established agents only. Particulars supplied. (A 7)

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PYROTENAX 7 core ·003 CABLE, new coils ex stock.—Boyce Weir & Co., 48 Whiteley St., Milnsbridge, Huddersfield. (E 350)

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Three Generators, each 2,200 kW, 400 v. d.c. 440/500 r.p.m., 5,500 amps.
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A.C. and d.c. Quarterly and Prepayment METERS.—Electric Meter Co., Melville Lane, Torquay. (E 203)

HOUSE SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (C 51)

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120 H.P. 400/3/50, 730 r.p.m. B.T.H. continuously rated SLIPRING INDUCTION MOTOR, ball and roller bearings, with slide rails. Oil immersed stator rotor starter, with triple pole stator circuit breaker, three overload relays and under voltage release.—Initial Laundry, Ltd., 300 Goswell Road, London E.C.1. (E 352)

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TRANSFORMERS 6·6 kV PRIMARY SUPPLY. Three 1,000 kVA indoor type, tubular, oil cooled, by British Electric Transformer Co., secondary 400/3/50. Neutral available. Tappings provided on h.t. side at plus and minus 2½ and 5%. Delta star connected.
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Divisional Secretary.

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NOTICE is hereby given that Societe Anonyme Dite Compagnie des Lampes seek leave to amend the Complete Specification of the Letters Patent No. 616251 for an invention entitled "ELECTRICAL WELDING OF ARTICLES OF GLASS OR OTHER VITREOUS MATERIAL."

Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 3190, dated April 5, 1950.

Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 36 at the Patent Office, 25 Southampton Buildings, London W.C.2, on or before May 5, 1950.

J. L. BLAKE,
Comptroller-General.
(E 317)

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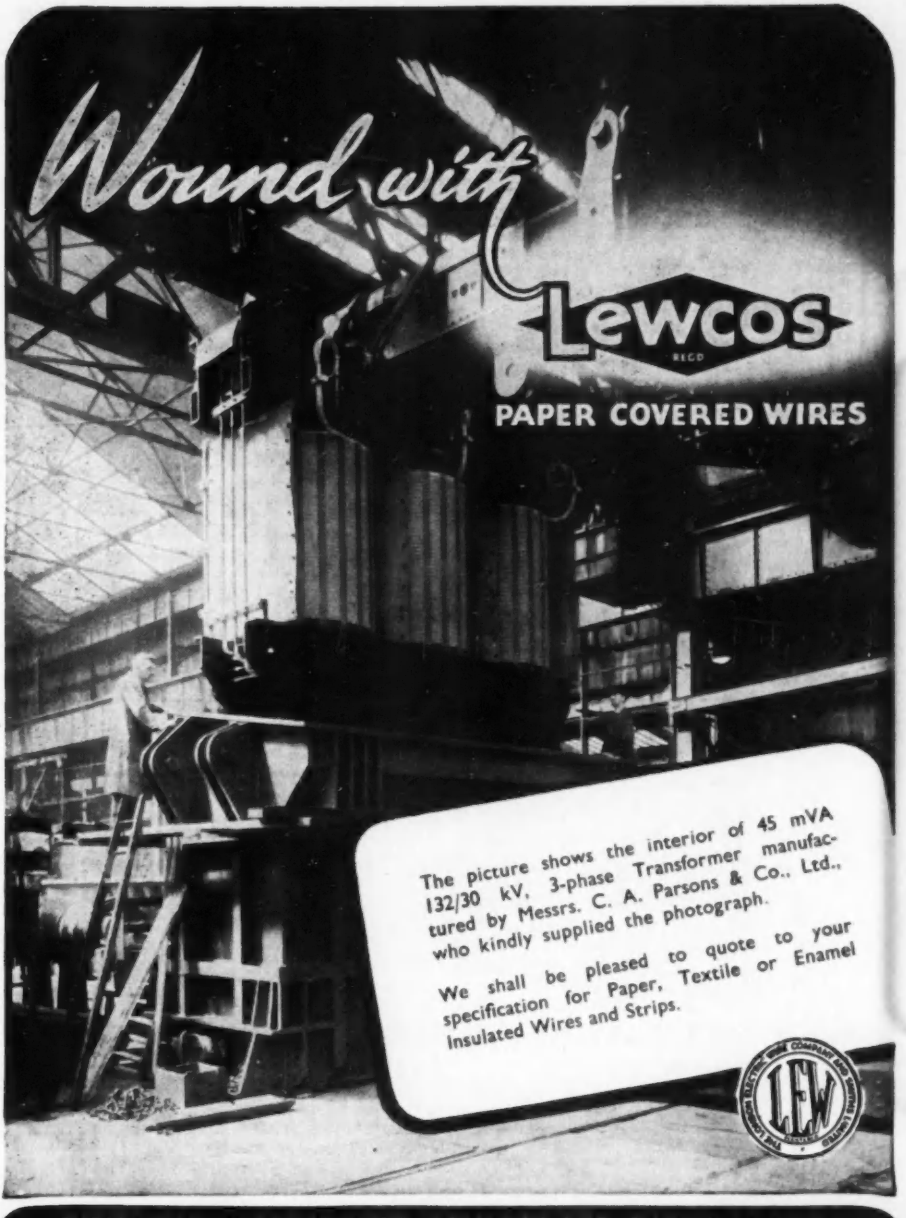
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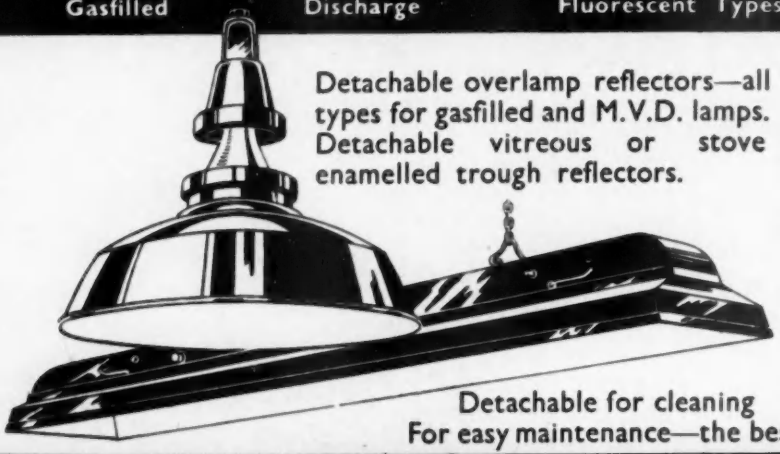

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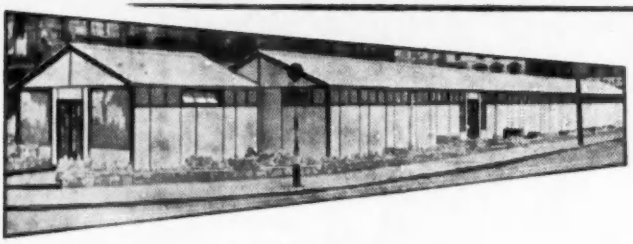

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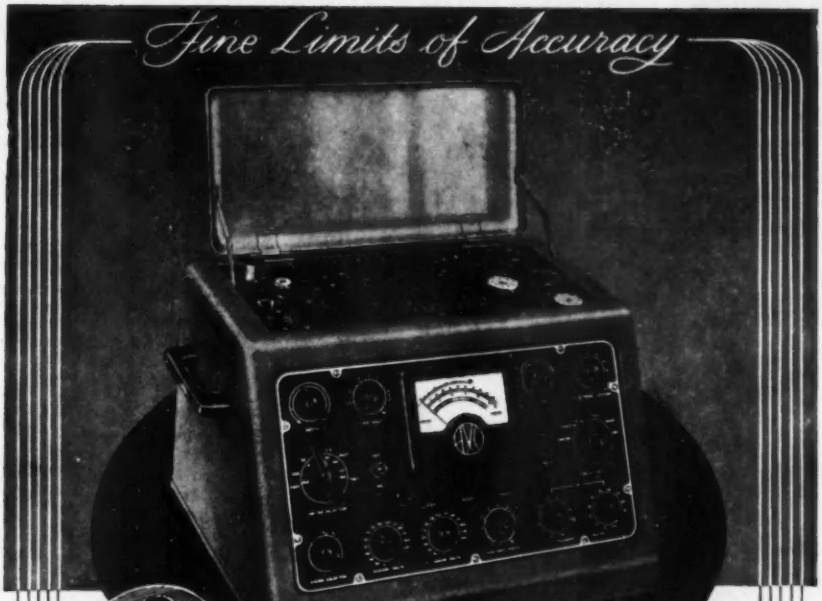

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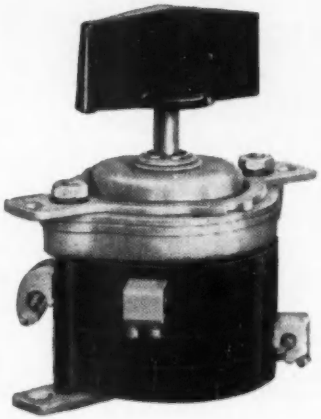

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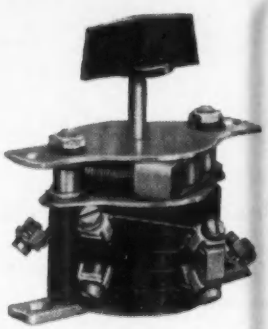

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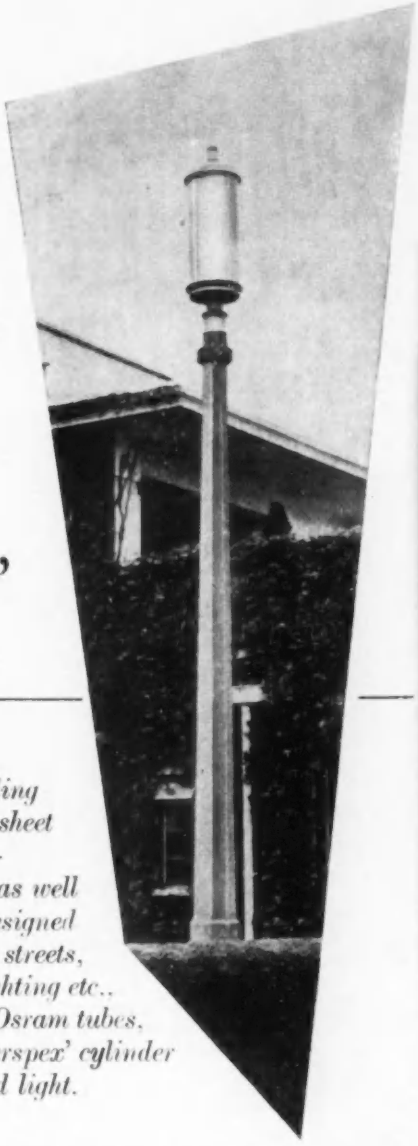

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P.393

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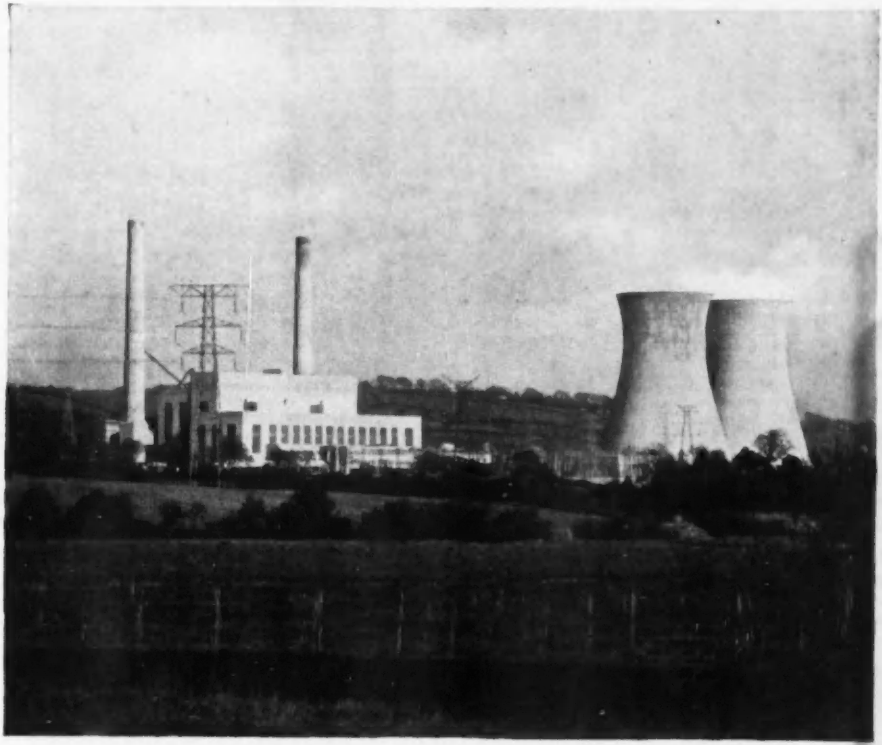

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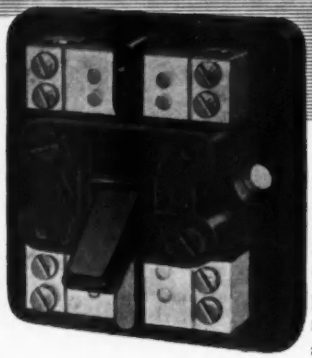

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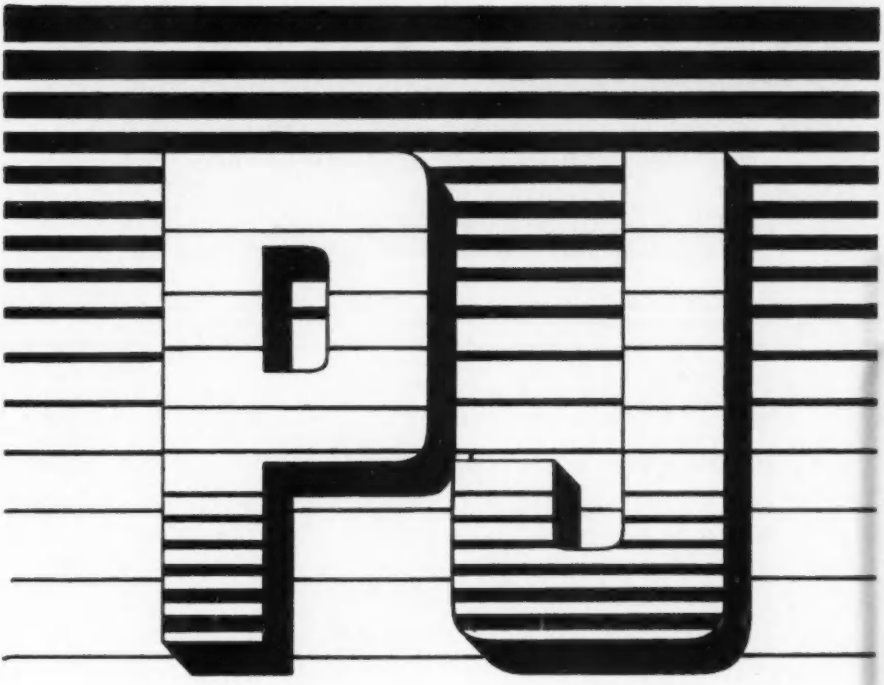

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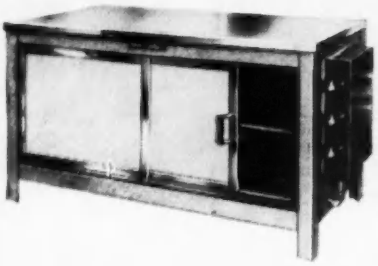

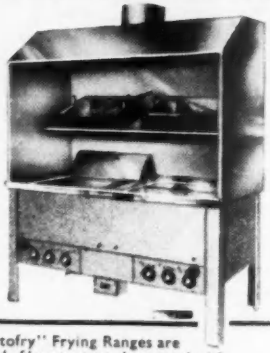

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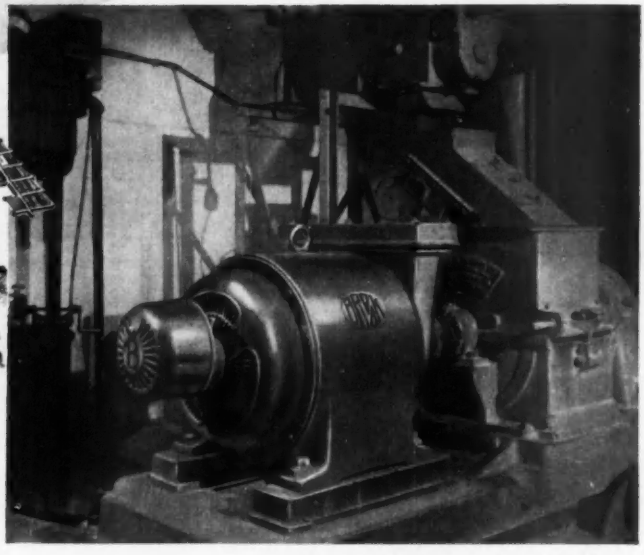

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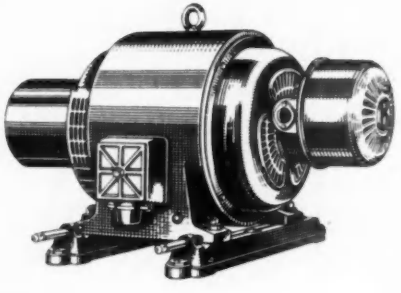

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